THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED THE ALUMINUM WORLD, THE BRASS FOUNDER AND FINISHER, AND ELECTRO-PLATERS REVIEW.

A TRADE JOURNAL RELATING TO THE NON-FERROUS METALS AND ALLOYS.

OLD SERIES VOL. XI., NO. 3. | NEW YORK, MARCH, 1905. | NEW SERIES VOL. III., NO. 3.

THE METAL INDUSTRY AND THE ALUMINUM WORLD AND THE BRASS FOUNDER AND FINISHER AND ELECTRO PLATERS REVIEW

PUBLISHED MONTHLY BY

The Metal Industry Publishing Company

(Incorporated)

61 BEEKMAN STREET, NEW YORK

PALMER H. LANGDON, ... *Publisher*
GEORGE P. SCHOLL . . . . . *Editor*
JOHN B. WOODWARD, ... *Director*

Subscription Price $1.00 per year, postpaid to any part of the world. Single copies, 10 cents.

ADVERTISING RATES ON APPLICATION.

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ENTERED FEBRUARY 10, 1903, AT NEW YORK, N. Y., AS SECOND CLASS MATTER UNDER ACT OF CONGRESS MARCH 3, 1879.

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CURRENT MEASURING INSTRUMENTS.

It is a gratifying fact in looking about in various plating establishments to find that the use of electrical measuring instruments among the platers is considerably on the increase. In fact it is hard to see why the platers were not quicker to see the advantage of thus being able to control their operations perfectly and to be sure that they could get the same results in one case as in the other. A good deal of this indifference can of course be laid at the door of their generally limited acquaintance with electrical matters. It is not surprising that this should be the case, for though the interrelation of the electrical units is very simple to one who has once understood them, yet it is nevertheless a fact that it is one of the hardest matters to teach to electrical students. Expressions which one frequently hears among platers, as for instance the following: "a strong current of so many volts," show that they have not yet fixed in their minds the fundamental differences between the different electrical units. The electrical unit called volt is entirely different from that which measures the strength or quantity of the current, which latter is determined by the amperes flowing through the circuit.

The volt measures the electrical tension or pressure existing between the electrodes, and the strength of the current, that is the amperes, depends with a given voltage entirely upon the resistance in the plating bath. Therefore, with a greater amount of wares in the bath or with a greater concentration of the solution, both of which factors will decrease the amount of resistance offered to the passage of the electric current through the plating solution, the amperage will be greater in proportion as the resistance is decreased, provided that the voltage between the electrodes remains the same. Any other cause which will decrease the resistance of the solution will of course have the same effect.

The simple and fundamental electrical equation $I = \frac{E}{R}$, where I is the amperage, E the voltage and R the resistance, expresses the above fact in mathematical language and gives the means for calculating the quantities in any given case, bearing in mind that one ampere $= \frac{\text{one volt}}{\text{one ohm}}$. In order therefore to cut down the

strength of the current, it obviously does not matter at which point of the circuit the rheostat is inserted, as its function only consists in introducing resistance into the bath and preventing the amperage of the current from rising too high and burning the goods.

A very convenient expression has been introduced within late years into electroplating nomenclature, namely, the "Current Density." This expression is not used among the platers yet as much as it deserves, inasmuch as it furnishes a convenient means for designating the number of amperes required for a given surface of electrode, in order to obtain the best results. If, for instance, a certain deposit is stated to be obtained with the best results by using a current density of 3 amperes per sq. foot of kathode surface, it means that the current should be so regulated that as many times three amperes are passing through the bath as there are square feet of surface of goods being plated in it. It thus furnishes a very convenient means of keeping the conditions for electroplating uniform and preventing the spoiling of the goods.

THE INFLUENCE OF SPECIFICATIONS.

There has occasionally been a good deal of opposition among manufacturers in various lines of business, against the imposing, on the part of the purchaser, of rigid specifications, to which the manufactured articles had to conform. It has been the same way with the specifications laid down by the United States Government in regard to the various brass, bronze, etc., supplies which it purchases. These specifications were first considered quite a hardship, but now the manufacturers declare their ability of not only being in a position to meet them successfully but of furnishing a still better product, which exceeds the maximum requirements of the specifications.

The reason for this is plain. The imposing of rigid specifications forces the manufacturer to pay the strictest possible regard to observing all precautions, which are necessary in order to insure the greatest perfection and uniformity in his articles. This must inevitably react on the practice in vogue in all departments of his plant and has the tendency to eradicate any slipshod methods that may have been formerly used and were good enough as long as nobody cared particularly whether the article furnished was just as good in one case as in the other. It led to the scientific investigation of the best methods of obtaining the desired results and to extended investigation along chemical and physical lines and consequent discarding of the old rule of thumb methods. There is no doubt, therefore, that specifications have had a decided and beneficial effect on the quality of the products of the brass and bronze industry and have had no small share in bringing about the present high status of the industry in this country, in virtue of which it occupies a position second to no other country.

While specifications are not of course an unmixed blessing and many of them, especially when drawn up by people who think they know more about the subject than the manufacturer himself, are apt to provoke a smile on his part, yet there is no doubt, that specifications, intelligently drawn, with a full understanding of the properties of the articles required, are a thing rather to be welcomed by the intelligent manufacturer, than to be fought against.

OURSELVES.

In consistently following out the policy of covering the whole field of the non-ferrous metals thoroughly, THE METAL INDUSTRY in the present issue contains again a number of original articles dealing with different subjects of interest and importance to the workers in the various branches of the industry.

The endeavor of the journal is not only directed towards keeping its readers acquainted with the progress of the industry in this country, but it aims also to keep them constantly informed about the developments abroad so as to enable them to compare their practice with that of their fellow-workers across the seas. Evidence of this endeavor is furnished by the articles in the present number on "Modelling in the Brass Foundry" by one of our British correspondents, and the first installment of a review of the practice in some of the leading brass foundries and rolling mills in Germany and Great Britain, which will be continued in following issues. We are happy to say that the endeavors of THE METAL INDUSTRY are appreciated by its subscribers, as is shown by the many letters of approval received from them.

In briefly calling attention to some of the leading articles which have appeared in THE METAL INDUSTRY during the past few years, we do not intend to blow our own horn, but simply to put before our readers, and especially those of them, who have not been subscribers to the Journal from the start, a concise review of the various subjects dealt with. Among the articles were: Spilly Brass, its cause and remedy; Casting Brass in Metal Molds; The Use of the Skim Gate; Aluminum Brass; The Annealing of Brass; Tobin Bronze; The Royal Copper Finish; The French Gray Finish; New Process of Rolling Copper, Yellow Metal and Naval Brass; The Use of Shrink Balls on Patterns; Metal Spinning; Casting Sterling Silver in Sand; Casting Aluminum Bronze for Rolling into Sheet; An Inexpensive French Gray Finish; The Theory and Use of Risers; The Preparation of Work for the Nickel Bath; Close Plating and Its Method of Manufacture; Brass Plating Solutions, Their Use and Abuse; Ormolu Gold Finish; The Bates-Peard Process of Annealing; The Revival of Pewter; Dynamos for Electroplating; Modern Plating Installations; The Casting of Large Bronze Tablets; The Importance of the Casting Temperature; Expanding and Flanging Tubes by Machinery; Recent Tests of Alloys; The Modern Way of Producing Verde Antique; New Chucking Machine for Brass Goods; The Birmingham Brass Trade; Casting Bronze by the Cire perdue Process; Black Nickel Plate and Its Production; French Sand Molds for Casting Gold, Silver and Brass Metals; Modern Mold Making and a number of others. The information contained in all these articles, together with that furnished by the short matter and the correspondence and patent departments, certainly make THE METAL INDUSTRY worthy to occupy a prominent place in the library of every worker in the field of the non-ferrous metals.

THE METAL INDUSTRY during its career has been twice enlarged, the last enlargement taking place with the February number. Further enlargements will be made as occasion requires, and no efforts will be spared, as shown by the variety of matters dealt with in the recent issues, to make the journal more interesting and instructive than ever.

MODELLING AS APPLIED TO BRASS FOUNDING.

By W. C. Parman, England.

The art of modeling is quite an intricate one, inasmuch as the modeler must know the true forms of animate and inanimate subjects and must be proficient in light and shade. He must also be well accustomed to geometry and drawing and his hand and eyes must be absolutely true, because most of his work will not permit the use of compasses, square or rule. He works with various materials, such as modeling clay, a specially prepared clay, plasterine, a patent preparation, and modeling wax. His tools are composed of wood and steel of various shapes and sizes, some of which are illustrated in the accompanying illustration. (Fig. 1.)

There are various mixtures of modeling wax, but the one I find most suitable for all temperatures is composed of the following ingredients:

48% beeswax,
14% Venitian red,
84 % beeswax,

The wax is first melted in a long-spouted pot, after which the color is added, and lastly the tallow. Great care must be taken not to get the mixture too hot, and if not watched it will boil over and cause trouble. When the

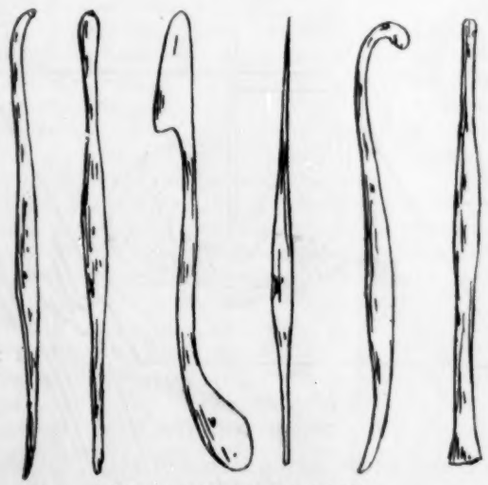


FIG. 1—MODELER'S TOOLS.

modeler has the design before him, he has to determine the manner of form it is required to be done in. The designs as a rule are chiefly mere outlines, with a little shading thrown in. The modeler therefore has to draw upon his experience in order to fashion the article correctly. If the work is large, clay is used, but in most cases plasterine is employed. The latter requires no preparation, is plastic and remains in the proper condition for a long period and is suitable for all temperatures. If the work is circular, square or in a number of sections, a foundation of the particular shape is first prepared, perhaps of wood, plaster or other suitable material. This is then divided into the number of sections required, and this stage of the work must be exact, as the success of the finished article depends upon it. Therefore the molder cannot be too exact and careful at this stage.

After mapping out, he takes his plasterine and tools and fashions the article to the required form. In flat modeling of double sided articles, such as reversible models, scrolls, etc., glass is used, a tracing being taken from the design and pasted on a sheet of glass. The glass is then turned over and the design is plainly seen, so that the modeler can proceed to build up his model. If the latter is two-sided, he reverses the tracing and models the other side, takes the waxes out of the mold and sticks them together. Sometimes a plaster slab is used, the face of which is cut into squares of equal size. The drawing is sketched upon the same and by the aid of the squares the

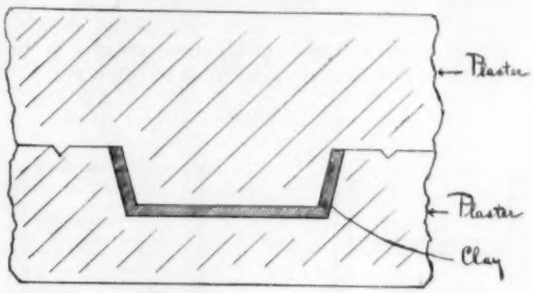


Fig 2

FIRST METHOD OF REVERSING.

design is made exact. A casting is taken from the model and the same method is employed as in the former case.

The reversing is a most important part of the modeler's work. It does not call for a great amount of knowledge, but it requires care. There are various methods of reversing, of which I will describe two at this time, while in a later paper I intend to discuss the others. Both methods are illustrated in Figs. 2 and 3.

The first thing required is a lump of fireclay and two straight pieces of wire about sixteen inches long and of such thickness as the metal is required to be. A piece of tube about 1½-inch in diameter and about fourteen inches in length is also required. The clay is placed on a flat surface with one wire on each side. By the aid of the tube the clay is then rolled out to the required thickness, the wire insuring an even thickness. The model which is to be reversed is first prepared. If it is of wax, it requires to be oiled; if it is of plaster, it must be soaped and if of wood and wax, the wood should first be varnished to prevent the oil from soaking in too quickly. A plaster mold is then made from this and allowed to set. Strips of clay are then cut off and placed in the mold, great care being required to get them in uniformly all over and not to get different thicknesses. Another plaster mold is then run upon this and when the latter is set, the two molds are taken apart. The clay is then removed and a gate cut by which the wax is to run in the space thus left free. The molds are then slightly oiled and all traces of water must be removed, as otherwise the wax will not be sharp and free. As the wax is kept melted already in a large long-spouted pot, it is poured into the molds. It is then allowed to cool, the molds are taken apart and instead of a solid model there is obtained one of uniform thickness.

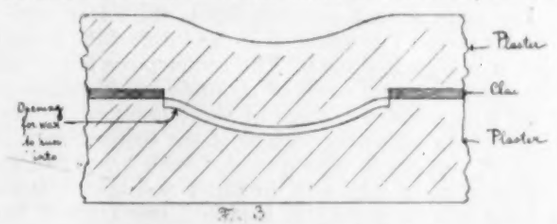
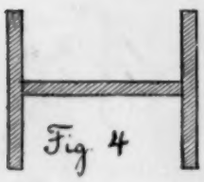


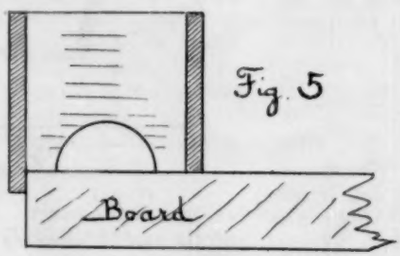
Fig. 3

SECOND METHOD OF REVERSING.

The other method requires more skill and patience, but

a more perfect reverse and what is called a perfect reverse is obtained, that is, the back is a replica of the front. Having the model as before it is prepared in the same way as before, the mold is taken and allowed to set and when set is taken off and soaped. Some plaster is then taken and poured into the mold. When the second lot of plaster is firmly set, the operator proceeds to separate the two molds, which is done by gently rapping with the hammer. After a little rapping they become slightly loosened and they are then gently parted. A true representation of the model is thus obtained. If there are any vertical sides to the models, these require to be cut away by the aid of steel carving tools to the correct thickness of metal required. After the operator has finished carving correctly he proceeds to prepare the clay as before by the aid of the wire and rollers to the thickness wanted. The gate is cut in the mold and it is placed in water for a short time. Completely dry clay is then cut into strips ¾ in. to one inch thick and placed around the edge of the mold. Now great care must be taken to properly join the pieces of clay together, as they will allow the wax to run out if this operation has not been performed properly. The molds are then placed together, care being taken that they are true. This is controlled by the aid of scratches which have been placed on the sides of the molds before they were parted. The scratches are made in such a manner that it can be ascertained whether the mold is true on all sides. The wax is then poured in as before and a true reverse obtained.

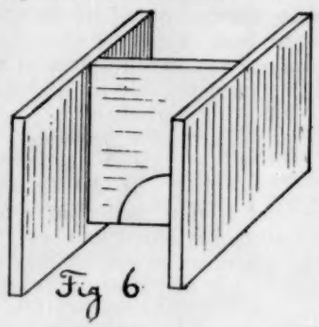


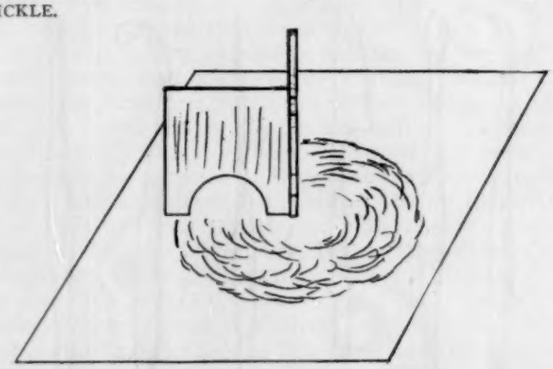


STRAIGHT STRICKLE.

A molding of any shape and length is produced by straight and circular strickling. The strickle is made of three pieces of wood firmly screwed together. It has one center piece about eight inches long by six inches wide and three quarter inch thick. On the one edge is fixed another piece of the same size and thickness and is dovetailed into and screwed to it, level at the top and at the bottom. Another piece of the same length, but about one inch wider, is fixed in the same manner to the other edge, so as to project one inch below the lower edge of the center piece. The whole is in the form of the letter H, as shown in Figs. 4, 5 and 6. The center piece is cut away in the form of a semi circle of about five inches diameter, and on it is screwed a piece of sheet brass of about 17 wire gauge, in which the pattern of the required molding is cut. A support is then provided with a level surface and sides at right angles to the latter and upon this surface some well tempered clay is placed, free from all hard substances. It is then moistened with water by means of a sponge, and the strickle, which is held firmly in the hand, is gently pulled over the clay. No attempt must be made to get the pattern molding at one stroke, but the strickle should be lowered gradually at each pull till it rides level on the board or the iron plate used as support and with the projecting side of the strickle close to the side of the board. This operation requires a good deal of patience and care, as otherwise more clay is dragged off than is necessary and the pattern will not be correct. If this should occur, more clay must be taken and the bad places be patched up. The strickle is then gently pulled over the surface again until the molding is correct. A plaster is then taken from it and reversed by any of the two methods described above.

The circular strickle, which is illustrated in Fig. 7, requires a flat board with a column firmly fixed in the center, and a piece of wood, say a foot long and eight inches wide, of the same thickness as before and cut out in the center. On one edge there is a piece of metal with two sockets, so as to slip over the column in the center of the board, which forms a kind of hinge. A sheet of metal with the pattern cut out is screwed upon the board, the clay is placed upon the support in a circular fashion and the strickle is drawn round and round until the required finish is obtained. A plaster cast is then taken from the mold, which can be reversed by either of the two methods described above.





ROUND STRICKLE.

ZINC-MAGNESIUM ALLOYS.

According to recent investigation the alloy with 10 per cent. zinc can easily be filed and sawed, but when hammered it develops cracks. With increasing content of zinc the strength of the alloy decreases. A 20 per cent. alloy can be broken up with a hammer, the 30 per cent. alloy breaks still easier, and the fracture is granular. From 50 to 90 per cent. of zinc the metal breaks under the hammer and often already during sawing. The fracture is either conchoidal or fine-grained. The color of the alloys is white, more or less shining.

Aluminum bronze is improved by remelting, which can be done without sensible loss of the metals, inasmuch as both of them are only vaporized at a high temperature. The alloy therefore does not materially change its composition during remelting.

THE CAUSE AND PREVENTION OF FIRE CRACKS IN GERMAN SILVER.

By Thomas Clare.

German silver is a very hard and stubborn metal to deal with when it is rolled down, and therefore good strong rolls are an absolute necessity so that sufficient draft or pinch may be given to the metal in order to prevent fire cracks during the process of annealing. Those cracks sometimes do not appear in the metal until the latter has been put through the rolls after it has been annealed. In that case they will show on the face of the metal as vertical cracks, as shown in Fig. 1.

The reason for this phenomenon is that the plate of metal has not been given sufficient draft, so as to close the grains of the metal all the way down to the center of the ingot. When the outside of the metal is compressed and the center grain left open or soft, by reason of insufficient draft in the rolls, the compressed or closed grain on the outside expands and the center grain, which is not compressed, remains undisturbed. Different stresses are thus set up in the metal when the latter is annealed and the result is the production of fire cracks. If the whole body of the metal, however, is compressed uniformally, that is, if the grain is closed right down to the center, the whole body of the metal will expand evenly during the process of annealing and the metal will be free from fire cracks.

The same precaution is necessary to be taken for each rolling, from the cast ingot to the required gauge, and when care is taken, the metal may be rolled down to any number on the gauge plate. When the metal is annealed and taken from the muffle, care should be taken to place the hot metal down very gently. If this precaution is not taken, the metal is liable to crack.

There are other cracks than the above in German silver, which are caused by the presence of impurities in the metal, such as filings, floor sweepings, skimmings, etc. If these impurities are not thoroughly refined, those cracks will appear. The cracks are, however, of an entirely different appearance than the true fire cracks and look something like those shown in Fig. 2. At times these impurities will cause cracks of a different appearance and which are called in the trade "fish-tails." In that case the cracks open up in the manner shown in Fig. 3. If it should happen that any metal foreign to German silver should get into the crucible, such as antimony, bismuth, aluminum, tin, etc., the metal is also pretty sure to crack in the manner shown above. Complaints have frequently come under my notice, where, after the metal had left the rolls in good condition, cracks have appeared during the different processes to which German silver is subjected in the subsequent processes of manufacturing. For instance it sometimes happens that a metal spinner, through lack of knowledge of the material he is dealing with, will open a door or a window in hot weather, while his metal is in the annealing muffle. If then he opens the door or mouth of the annealing muffle, the air will strike the red hot metal and in consequence the work which he is annealing will crack badly.

Other troubles occur sometimes during the annealing of large blanks. Take for instance the case of a silversmith who uses a large round blank in order to hammer up a punch bowl. After hammering so much till the grain of the metal is closed, he has to anneal the blank, so as to get it soft again. If he cannot get the blank in the muffle, which very often happens, he has to anneal it under the gas flame. If he allows the flame to strike in the center first, and I have known it to be done, the metal will be sure to develop fire cracks. The operation should be conducted in such a manner that the gas flame is first thrown lightly over the entire surface of the blank. The operator should then begin to anneal on the outside edge and proceed slowly to the center. By so doing he will give the metal a chance to expand evenly and will avoid the formation of cracks.

Again I have known of instances where a chaser, having to work on the bodies of the tea pot, the creamers, etc., of a tea set, prevailed upon the silversmith to let him work on the articles in question before the handles and spouts were soldered on. The process by which the chaser ornaments the pieces, namely by hammering them with steel tools, naturally closes the grain of the metal. As a consequence, when the silversmith took the bodies to put on the handles and spouts, the chased and ornamented parts expanded under the heat of the gas and

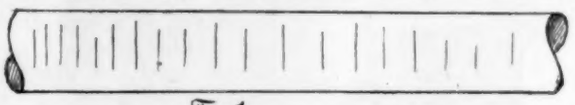


Fig. 1

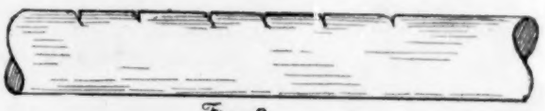


Fig. 2

Fig. 3

FIRE CRACKS IN GERMAN SILVER.

cracked, while the parts which had not been worked by the chaser remained unaffected.

In making German silver wire the metal is cast into an iron mold 6 ft. by 3½" by 1½" and then rolled down in the usual way. Care is taken of course as in the sheet metal to give it sufficient draft so as to close the entire grain and to prevent fire cracks. When the wire is rolled down to the required size, it is slit into strands and wound up into coils on a drum. The coils are then bent first one way, then another, before they are annealed. This procedure prevents cracking. They are then annealed, after which they are ready to be broken down by the wire drawer. The wire is then drawn through a steel plate to the required size onto an iron drum into coils. The operator then takes the coils and bangs them on the bench several times in order to take out the spring. This precaution is necessary before annealing again in order to prevent the formation of fire cracks.

When thick wires or bolts are required, the metal is cast into square bars 1¼ or 1½ in. thick. These bars are then rolled down to about ¾ inch, so as to stand the fire without cracking. They are then rolled in grooved rolls, with round or square grooves as needed. My experience has shown that it is a hard matter to close the grain in

round grooved rolls, but to prevent fire cracking, the rods are put under a drop hammer faced with wood, in order to prevent bruising the rods. They are hammered for about fifteen minutes and they will then take the fire without cracking.

Instances of fire cracks due to the various causes pointed out in the preceding have frequently come to my knowledge. They are hard and true facts and the remedies and precautions pointed out above should not be forgotten in annealing and rolling a metal like German silver, which is so difficult to treat.

SILVER DEPOSIT WORK.

By F. B. Forster.

That a new technical discovery, when taken up by the general public, often brings large profits to the originator, is a well known fact, and the process of silver deposit work on glass and porcelain has proved no exception to this rule. The Metal Industry has published some very valuable articles on this subject, but the writer wishes to place before its readers a few workshop experiences that may be of value to workers in that line.

CLARET PITCHER DECORATED WITH SILVER DEPOSIT WORK.

Buyers of objects, decorated with silver deposit work, wonder how such results are obtained. They cannot understand how for instance the rings at the top and bottom of a frail glass bottle are fastened and combined with the intricate tracery of the design on the body of the bottle.

Many surmises are indulged in and some persons believe, that the bottle is covered with silver, and the parts which are not desired are cut away. Others say that the design of silver is hammered on, and so fastened, forgetting the time and labor such a process would entail, were it possible to be done without breaking the object operated upon. The work is done in reality by electricity, after proper preparation of the object to be decorated.

Formerly a glass bottle was covered entirely with silver, then the design was painted on with a solution of asphalt, gum mastic and turpentine, and the bottle placed into nitric acid, which would eat out the uncovered silver. The latter was afterward thrown down from the acid and recovered. Apart from the length of time required, and the wastefulness of the process, it hardly ever gave satisfactory results, because the acid would eat under the painted design more or less, and the lines were never sharp and distinct. They had to be worked over by an experienced hand, which increased the cost so much that the article could not be sold readily. I have in my possession a small Eau de Cologne bottle, with silver deposit work, which I bought some years ago from one of the first manufacturers of silver deposit work, and for which I paid $5.00. To-day a similar bottle, with the same design, is sold for $1.00; this reduction in price is brought about by the cheapening of the process.

The easiest and surest way for silver deposit workers to get good results, that I know of, is to cleanse the article to be decorated in a thorough manner by immersion in an alkaline bath so as to dissolve all fatty matter. After washing the glass or porcelain in pure water, to get rid of the alkali care must be used not to touch the article directly with the hands, however clean they may be. The desired design is then painted on with bright silver which can be bought from the dealers in chemicals, if the manufacturer is not able to make his own, which he ought to be, in order to get the best results. After all the pieces are prepared and allowed to dry, they are placed into a gas kiln of suitable size and are exposed to a firing that will vary according to the article, its composition, and the supply and pressure of the gas. There is now an oil kiln on the market said to give very good results, but I have not used such a kiln and cannot speak from experience.

The firing of the goods is an art and has to be acquired by practice, but any intelligent worker learns it after some time. It goes without saying that no manufacturer will fire glass and porcelain together. Each must be fired by itself, and even when glass is fired by itself care must be used not to mix the soft lead and soda glass with the harder glass, because the softer glass requires less time to fix the design. It is necessary to leave the muffle open for some time to allow the evaporation of the oils which are present in the bright silver before the kiln is closed. The fire must be started slowly and its intensity increased gradually. For glass a dull red heat is required, while porcelain requires a higher degree of heat.

The kiln ought to be placed in such a manner that the room can be darkened so that the eye of the worker may get relief from the glare in the kiln. The room ought to have sufficient tables, etc., to place the fired articles upon.

As many losses occur by opening the kiln too soon, it is best to wait a sufficient time and not lose the decorated articles. The kiln ought always to be kept closed, and never to be filled without wiping it with a dry cloth to remove any dust that may have settled in the muffle. Each article being inspected it will be found that the design shows silver white on the glass or porcelain and is burnt into it, making thus a perfect metallic conductor for the electric current. After being lightly scratch-brushed, the article is placed into the silver bath where the deposit can be made as thick as the operator wishes.

It is useless for me to explain the details of the electric bath. Every plater has his own formulas which he considers best, but I am quite sure that most platers know but little of the composition of bright silver, bright gold or of a preparation of copper, which is also used in burning in the design. After the deposit is completed it is turned over to the engraver who embellishes the design. The deposit is either buffed and left bright, or is oxidized.

New decorations of silver deposit work, in combination of gold and silver, have appeared and make beautiful and costly work. Bright gold is used for the paint in the first place, and of course the material is more expensive, but the goods bring a much higher price in the market. The latest development in silver deposit work is the incrustation of silver wire into etched glass, the Niello of the Russian workers. I have seen some fine samples brought from Europe, and a manufacturer is now trying to reproduce it here. Manufacturers of bright silver and bright gold consider their processes for these articles a secret of value, but all silver deposit workers ought to be able to make their own, if they want to manufacture in the cheapest and safest manner, because I have found bright silver very much adulterated with worthless chemicals in order to make the bulk appear large.

As we go to press there are again rumors of the consolidation of the National Lead Company and the United Lead Company, but no definite information is obtainable.

GERMAN AND ENGLISH BRASS FOUNDRIES AND ROLLING MILLS.

By Axel Westman.*

Copper Works Deutschland, near Berlin.

These works produce copper wire, rods and bars of various shapes, brass wire, rods and bars of various shapes and brass sheets. The raw material is American ingot copper, electrolytically refined. For the brass manufacture the works use Silesian zinc, Mansfield copper in ingots and cathodes as well as the scrap which accumulates from their own manufacture. They also use a certain quantity of purchased scrap. The power necessary for the establishment is furnished by six Cornwall boilers arranged three in a row at both long sides of the boiler house. In the foundry where the ingots for the brass rods and wire are manufactured, the crucibles are arranged below ground, in one row along one side of the building. The graphite crucibles can take 220 pounds of metal. The melting is done by coke with the help of blast, which latter enters by small tuyeres immediately above the grate.

The melting is done in the following manner: The copper is first melted under a protecting cover of charcoal, the scrap is then introduced, and at last, while frequently stirring with an iron rod, the necessary quantity of zinc is added, which has been somewhat heated previously. When the most favorable temperature has been reached after several minutes, the alloy is cast into previously heated molds. A diagram of the latter is shown in figure 1. They consist of two parts and have very thick walls; they are oiled before the cast. The round brass ingots thus obtained have about 3⅛ inches diameter and are about 3 feet long. The thick-walled ingot molds used by this concern are stated to have the advantage that the alloy attains a higher tensile strength and at the same time a great homogeniousness owing to the quick cooling action. If the cooling takes place slowly, the copper, which has a greater specific gravity than the zinc, has a great tendency to separate out partly and to sink to the bottom of the ingot. The lower portion of the ingot will therefore contain more copper than the upper one. The waste is high, namely 0.5 per cent for the copper and 6 per cent for the zinc. The round brass ingots thus obtained are rolled into rods or wires.

The rolling mill, which contains a rod and a wire rolling train, is located in a building of about 2,100 square feet area, the whole floor being paved with cast iron plates. Both rolling trains are driven by a 400 horse-power tandem compound condensing engine. The crank shaft of the machine is directly coupled to the rod mill and the power is transmitted to the wire mill by ropes from an 18-foot flywheel which sits on the same shaft and which has a weight of 30 tons. The rod-rolling equipment consists of four three-high trains and runs at a speed of 60 revolutions per minute. The wire train can be run at a speed of 360 or 460 revolutions per minute, respectively, by changing the wire rope pulley. Bars of trapezoidal cross sections, so-called "wedge copper," are also rolled, and are used for commutators in direct current machines or for collectors in alternating current machines. The wire-rolling equipment comprises eight trains, the diameter of the rolls being 9⅞ inches. The daily output, when rolling 7 mm. (about 9-32 inches) copper wire, is about fifty tons with the higher speed. The annealing furnaces for the copper and brass ingots, the latter of which contain 36 to 40 per cent zinc and are rolled hot, are ordinary reverberatory furnaces, heated by bituminous coal on a horizontal grate.

To further work the copper or brass rods rolled in the rod mill there are installed eight drawing benches. Each rod is very thoroughly inspected before drawing and is either cleaned by hand, with a cold chisel or between a pair of rotary millers of any blow holes, slags, etc. Round, square and hexagonal copper and brass bars are drawn here, and the "wedge copper" rods mentioned above are cut into exact lengths. The accompanying figure 2 shows a few of the sections made. An article which is furnished on a very large scale are brass strips with gear tooth profile cut in. They are cut by the consumers and furnish small gear wheels for lamps and cheap watches. The necessary profile for the teeth is gotten by drawing the rods five to eight times, during one of which draws the drawing drum acts as a cutting tool. In order to give the copper

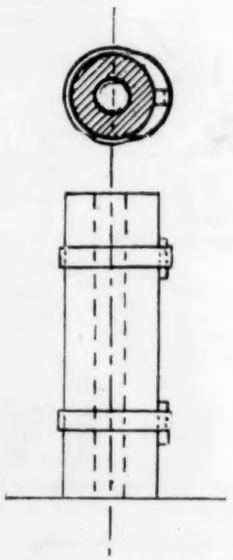


FIG. 1.—THICK-WALLED INGOT MOLD.

bars thus drawn an even and nice appearance they are greased with oil during drawing. For brass rods soap water is used.

The copper as well as the brass rods have to be annealed before each drawing, for which purpose two annealing furnaces are provided. They are heated by bituminous coal on a horizontal grate, and the flame travels around cast iron muffles set into brick work. The rods are introduced into these muffles and are therefore annealed without being touched themselves by the flame. In order to remove the thin layer of oxide formed during annealing, the rods are dipped in dilute sulphuric acid. The wire coming from the rolling mill is annealed in close iron cylinders. It is then dipped and afterwards washed in lime water. It then goes into the wire-drawing mill, where it is reduced in diameter from about 9-32 inch to 3-32 inch. All wire-drawing benches are provided with a friction clutch patented by the works, which allows an almost noiseless and very quiet starting. For medium wire the later is reduced from 3-32 inch to about 1-16 inch diameter in double and triple benches. The fine wire is reduced from about 1-16 inch to 0.0039 inch diameter

*The paper appeared originally in *Jernkontorets Annaler* and is here translated from the German translation in *Metallurgie*, Dec. 8, 1904. The author, a Swedish engineer, visited a number of works on the European continent and in Great Britain.

in tenfold drawing machines. The daily output is about 25 tons of copper wire of different dimensions, besides a large quantity of brass wire.

The drawing benches as well as the wire-drawing machines are driven by a tandem compound engine of 400 horse power, which machine serves at the same time as motor for two dynamos, the current of which is used partly for electric lighting, partly for running small electric motors for the elevators, cranes, etc. A storage battery is provided in case an accident should

FIG. 2.—SECTION OF ROLLED BARS.

happen to the steam, so that he works can be lighted in any case.

In the foundry where the ingots are cast for the brass sheets and which is very well lighted and very well ventilated, the crucible furnaces are also arranged below ground and in one row along one side. The ingots which are cast here have the following dimensions: 2' 3½" × 2' 3½" × 13-16", and weigh 160 to 180 pounds. In this case also molds with very thick walls are used, which are illustrated in the accompanying

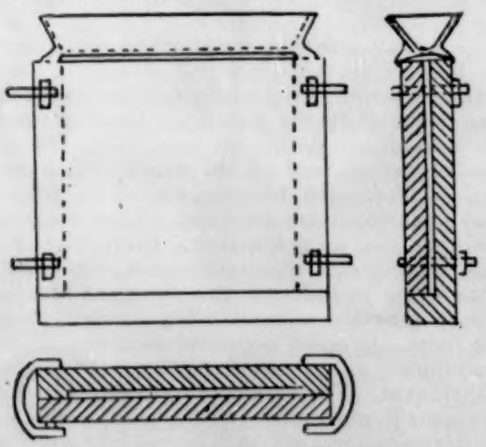


FIG. 3.—INGOT MOLDS.

figure 3. A sort of sieve or filter is placed upon the molds in order, in the first place, to keep away the impurities (zinc oxide, etc.), and on the other hand, to distribute the streams of molten metal better when casting into the molds. Both halfs of the molds are held together by lamps and wedges, and oil is used for treating their surface. The sheet-rolling mill is situated beside the foundry and occupies a space of 16,140 square feet. The ingots are rolled cold into plates. The steam engine is of the same kind as described above, but somewhat stronger, furnishing 450 horsepower. From the flywheel the power is transmitted by rope drive to another flywheel which sits on a shaft located below the floor level and which drives the rolls. Thereby all couplings between the rolls are avoided and the latter run smoothly and evenly. There are five three-high trains. The sheet rolls are as a rule more used up in the middle than at the edges and therefore they have to be trued up after a certain time. This is done by screwing the three rolls of a train closely together and letting them run empty with a large amount of water.

After the sheet ingots have been broken down, annealed and dipped they are carefully examined and any slag spots, etc., are cut out by rotary millers. As soon as the plates become too hard on account of the rolling they have to be annealed and dipped again. A finished thin sheet has been subjected to this operation sixteen, eighteen or even twenty times. Eight annealing furnaces heated by bituminous coal are provided, and in each furnace one cast iron muffle is placed in which the plates are annealed in heaps. After the plates have arrived at a faint red heat they are removed and cooled off in the air, as brass and copper cannot be cooled with water. The charging and discharging of the furnaces is done by ingenious appliances, which are mounted on the cars on which the plates are transported between the furnaces and the rolling trains. After the finished sheets have been cut with shears of the latest construction to the right dimensions they go to the store room. The works employ about 250 men.

PROPOSED COMBINATION OF GERMAN BRASS WORKS.

It is reported that a number of the leading brass works in a meeting held recently at Berlin have decided to elect a commission, which is to draw up the preliminaries for a new combination of the brass rolling mills. A Society of German brass works existed till October, 1903, but it was more apparent on paper than in reality. In the last months of 1903 negotiations were entered into on the part of several works in order to effect a more business-like and closer organization, but their result was negative and the Society disbanded at the end of 1903. A period of ruinous competition followed, which was made worse by the increase in the price of copper and zinc. A syndicate of copper sheet and copper tube manufacturers has been formed recently, and brought the question of a new combination again prominently to the mind of several brass firms. It appears however very uncertain yet, whether the attempt at establishing a new combination will be successful.

NEW TERMS OF DELIVERY ON SHEET COPPER.

On February 23 the sheet copper manufacturers revised their terms of delivery on sheet copper as follows: Actual freight will be allowed on all shipments of over 100 lbs. or more to points east of the Mississippi River instead of the Missouri River as heretofore. To all points west of the Mississippi and Missouri Rivers outside of the States of California, Oregon, Washington and Nevada, actual freight will be allowed to points on the Mississippi River in direct line of shipment and to all points in the States of California, Oregon, Washington and Nevada. There will be 1½c per lb. added to the net price in place of 1c per lb. as heretofore.

ORMOLU, BRIGHT GOLD AND ETRUSCAN FINISH ON THE SOFT METAL ALLOYS.

By Charles H. Proctor.

The French were the originators of the beautiful colors known as Ormolu gold. We find early examples of their work mostly on ornamental clocks of a generation ago, enclosed with glass domes to protect the finish from atmospheric influences, as at that time they were not as well versed in the making of colorless lacquers to protect the surface of metal as we are today. The lacquer then in vogue would have given to the beautiful soft luster the appearance of having been varnished and thus would have spoiled the effect intended by the originator. These clocks were cast in ormolu or white brass, of a mixture consisting of copper, zinc and tin, with a small proportion of lead. They were cleaned with acid dips, gilded and colored with potassium nitrate, alum, salt and other substances and burnished. The English also produced beautiful effects in imitation of the French ormolu on various kinds of brass goods, mostly ornamental candlesticks and half figures. These were ormolued in acid dips containing an excess of zinc sulphate, burnished and lacquered to represent gold.

It remained for the American to imitate his French and English brothers in this line of work and produce beautiful effects on the common alloys of lead and antimony. It is with these alloys of which so many articles are made that this article will principally deal.

The production of ormolu and bright gold on the soft metal alloys comprises several distinct processes, namely, casting, polishing, plating, dipping, burnishing and lacquering. We will take, for instance, an ornamental clock case which may consist of several parts. These parts are cast solid or slushed (if for hollow work) in bronze moulds. The parts are fitted and soldered together and the article is then sent to the polishing room to smooth down the plain surfaces. This may be accomplished on a rag wheel of from 4 to 10 in. diameter and 1 to 2 in. face, run at a speed of 1,500 to 2,000 revolutions per minute, using fine red sand mixed with lard oil, or a sand buffing compound, such as is sold by dealers in electroplaters' supplies, or common tripoli. The articles are then cleaned as soon as possible with benzine and a plater's hand brush, to remove the polishing compound, and dried in maple sawdust. They are then immersed momentarily in a caustic soda solution (4 oz. to the gallon), to which 1 or 2 oz. of strong ammonia water may be added, which is used near the boiling point. A hot solution consisting of 4 oz. of kalye to the gallon will give the best results of the two, as it does not act on the solder as rapidly as the caustic soda solution and cleans better. The articles are then washed and passed through a hydrochloric acid solution of 8 oz. to the gallon of water, washed again, and flashed until they are completely covered with copper. A cyanide of copper solution, consisting of water 2½ gallons, carbonate of soda 8½ oz., sodium bisulphite 7 oz., copper carbonate, 5 oz., potassium cyanide 8½ oz. at a temperature of 110 degrees or more or any other good copper solution may be used. The articles are taken from this bath, washed and plated in a sulphate of copper solution consisting of 24 oz. of commercial sulphate of copper and 2 to 4 oz. of commercial sulphuric acid to the gallon of water. This solution is used cold, but not below 70 degrees. The articles are plated with a medium current and low voltage from 15 to 30 minutes. If the current strength is right a beautiful, soft, lusterless deposit will be obtained, which is the ormolu base. The articles are then washed and immersed in a soap solution such as is mentioned in The Metal Industry, Vol. II., page 187, after which they are passed through boiling water and left to dry. The articles are then ready for the burnisher. This operation requires some little practice. The burnishing tool is made from steel and hardened and then polished to give as high a luster as possible. The articles are burnished on the relief parts to give a good contrast, common yellow soap being used to make the burnisher glide easily. After this the articles are ready for the brass striking bath and the gilding solution. The brass striking bath may be made of any good brass formula, but at about one-half the usual strength, with a small increase in cyanide of potassium. This solution is used at a temperature of 100 or 110 degrees. The burnished articles are passed

CLOCK FINISHED IN ORMOLU GOLD.

through the kalye cleaning solution mentioned before, washed and immersed in a cyanide dip of 2 to 4 oz. to the gallon, washed again and immersed in the brass striking solution for two or three seconds. If this is done well the color now will approach the ormolu gold color. The articles are now washed again in cold water and immersed in a hot gilding bath consisting of about 60 to 80 grains of 24kt. gold (in the form of fulminate of gold), 13 to 14 dwts. cyanide of potassium, ½ oz. bisulphate of soda and 1 oz. sodium phosphate to each gallon. This makes a good gilding bath for all purposes. Pure gold or platinum anodes may be used. The articles are flashed in this bath for two or three seconds and kept in motion until a uniform color is obtained, which should be a bright yellow for ormolu and a little deeper tone for bright gold. The articles are drained well, passed through running water kept for the purpose to save the drippings and which may be used to add to the gold bath when water is necessary, washed in the regular water supply, passed through the soap solution before mentioned, rinsed and passed through the boiling water and lacquered. The lacquer must be transparent and colorless, the best for this purpose being made by dissolving 4 oz. of pyroxyline in 1 gallon of amyl acetate, with

frequent agitation. In ten or twelve hours this will become a semi-transparent body, water white, and of the consistency of photographer's collodion. It is used as the body, equal parts of amyl acetate, fusel oil and benzine, mixed together in the order written, serving as the thinner. Equal parts of the body and the thinner make one of the best colorless lacquers for the purpose. Any good transparent lacquer may, however, be used in this connection, several brands filling the requirements being manufactured which are in the market. The articles should be lacquered as quickly as possible after gilding. If the water is not entirely evaporated the articles may be passed through a lacquer thinner and then into the lacquer, dipping being the best. They are then drained well and dried at 110 degrees. The various operations are performed very quickly when everything is done systematically.

Bright gold finish is produced by the same process, only instead of burnishing the articles are taken from the acid copper bath, scratch brushed with a fine brass machine scratch brush such as is used on silver deposit goods, or passed through a slow-acting, bright dipping acid bath. The latter should consist of 1 part pale aqua fortis to 2 parts sulphuric acid, 1 part water and a small quantity of hydrochloric acid. In either case the goods are rinsed well, passed through soap solution and boiling water and left to dry. They are then highly polished with a soft muslin or canton flannel coloring wheel of about 4 or 5 in. diameter and 1 in. face with the aid of crocus mixed with kerosene oil, which gives a rich color. The articles are cleaned in kalye solution, passed through the cyanide dip and through the brass striking bath, washed and gilded and lacquered as before. Goods made exclusively of spelter can be polished in the usual manner, like brass goods. They are cleaned as before and are given a good dense deposit in the cyanide of copper bath. For bright gold they are passed through a bright dipping bath as for the soft metal alloys, polished, flashed in the brass bath, gilded and lacquered. The articles may be deadened in the acid copper bath, three to five minutes being sufficient, burnished, brassed, gilded and lacquered as before. A good rich ormolu effect can also be produced on large spelter articles by a sand blast, using very fine sifted sand. They are afterwards polished on the relief parts, plated in the cyanide of copper bath, acid dipped, the relief parts highly colored on the rag wheel instead of burnishing, cleaned and flashed in the brass bath, gilded and lacquered as before.

The Etruscan or Brush Brass finish is quite popular. This splendid color is produced mostly on articles of solid brass, owing to the process of finishing, which on soft metal alloys would ruin the relief parts. Just as good results can be produced, however, by the following method on these alloys as on solid brass. The articles are polished as before mentioned, cleaned, flashed in cyanide of copper solution, washed and plated in the acid copper bath for fifteen or twenty minutes, washed thoroughly and scratch brushed with a fine brass wire brush as mentioned before, using a small quantity of carbonate of soda in the moistening water and just a very small amount of finely pulverized pumice stone on the goods when brushing. If this is done well, a beautiful effect is given to the goods, which effect is pleasing to the eye and much admired by lovers of soft luster finishes. The articles are washed, passed through soap solution and hot water, lacquered with a French varnish lacquer consisting of 1 part French varnish and 1 part fusel oil if for brush work. For dip lacquer 3 parts fusel oil and 1 part varnish is used, dried at a temperature of 180 degrees, or No. 2 Pyramid lacquer.

WHITE METAL MIXTURES.

By George H. Chandler.

The readers of The Metal Industry will no doubt be interested in the following formulas for white metal mixtures, which are somewhat stronger and harder than the usual ones. They are as follows:

65 lbs. lead.
35 " tin.
12 " antimony.
2 " copper.

The copper is melted in a crucible with the antimony first and then put in with lead and tin in the melting furnace. The metal is cleaned with potatoes or bones. The cost of the mixture is betwen 10 and 12 cents per pound, according to the metal market.

The following other mixtures are also suitable:

14 lbs. antimony.
100 " lead.
4 " copper.
15 " tin.
1 " phosphor-tin.

---

100 lbs. lead.
58 " tin.
14 " antimony.
3 " copper.
¼ " phosphor-tin.

---

75 lbs. tin.
31 " lead.
13 " antimony.
3½ " copper.

The last named of these mixtures has recently proved successful in a case where a mixture somewhat harder than the usual one was required.

APPLYING EMERY CLOTH TO POLISHING WHEELS.

The usual method of applying emery cloth to polishing wheels is to glue it to the surface, and this necessitates a screw press and other appliances of a similar nature. As the disc grinder is rapidly coming into use, a means otherwise than gluing emery cloth to iron wheels would be a method long sought for.

A method of doing this has recently been discovered and is illustrated in the sketch accompanying this article. A slot is left in the periphery of the wheel upon which the cloth is to be put and the ends drawn through. By means of a suitable clamping device the ends are securely fastened. This device enables fresh cloth to be easily put on a wheel when needed.

RECENT PRACTICE IN CASTING ALUMINUM.

In the casting of aluminum no fact stands out in greater prominence than the necessity to suit each mold to the particular casting being made. There are no iron bound rules which can be laid down in regard to packing, gating, risers, etc., since the moulder must exercise judgment in adapting his mold to the peculiar requirements of the casting being made. Therefore, what would be true in regard to one casting might be ruinous if practiced in regard to another casting. Hence any rules which may be laid down in regard to casting aluminum must necessarily be general and subject to adaptation to the case in hand.

It is eminently true that cores and molds should be soft where any of the sand is enveloped by the metal. The high shrinkage of aluminum will cause such castings to break in cooling unless the core or mold will yield to the shrinkage pressure. Generally speaking, therefore, the sand should be rammed as little as possible because of this fact, and from the fact that the low specific gravity of aluminum does not require a very strong mold as is the case with the heavier metals. In regard to coating the cores with graphite, it may be said that although this is a good practice, it is not necessary in every case.

The statement is also frequently made that the sand should be new. On the contrary, green or new sand is not so satisfactory as sand which has been used, and it is never well to start in to make castings altogether with new sand. It is also not absolutely necessary to use facing, although slightly smoother castings may result if it is used. The slicking tool should be judiciously used, as any mark made by it will appear on the face of the casting.

It is also not necessary to rub up with graphite the plumbago crucibles in which the alloys are melted, nor is it necessary to pour the metal immediately upon being melted. On the other hand, it is very unwise to let the metal stand over a hot fire and soak until it becomes burned. The way in which aluminum castings are poured will affect results very materially, and it is only after some practice that the best results can be obtained. Certain castings have to be poured quickly and the metal forced into the mold; other castings should be poured slowly. The metal should always be heated higher than the pouring temperature and then cooled down by stirring with unmelted metal, thus reducing it to the lowest temperature at which it is safe to pour the casting in question. This temperature, of course, depends largely on the thickness of the casting to be made.

The size of the gate for aluminum castings depends on the casting itself; certain castings require wide and others more moderate gates. It is always best to gate the casting which has the form of a ring, or approximately similar shapes, on the inside rather than on the outside of the casting. The inner part of the casting is liable to cool before the gates do, and in shrinking will sometimes tear loose from the gates if they are on the outer edge. This will be avoided where the gates radiate from the middle.

Rather large feeder heads or risers are used on the castings, but unless these risers or feeder heads are broken off before they become cool they will draw from the castings; in other words, they feed up to a certain point and afterwards begin to draw. The risers are usually broken loose from the castings just when they begin to solidify enough for the metal to cling together.

It is not necessary to use any fluxes at all or sodium salts. Any alloys which are added to the aluminum are added when the alloy in question is made up originally; in other words, no alloying ingredients are introduced into the metal which is poured into the castings.

PROPERTIES CLAIMED FOR MURMANN METAL.

This recently prepared alloy of aluminum and other metals appears destined to render valuable services to metal workers in different branches. Its color resembles that of aluminum but is somewhat more blueish. Its specific gravity is a little higher than that of aluminum, being 2.65 to 2.75 and 2.68 in the metal for casting purposes, while that of aluminum is 2.64. Murmann metal is marketed in two qualities, namely as a soft metal for rolling, drawing, pressing, stamping and the like, and a harder metal for castings in pieces of any size. Sheets and wires made of the softer metal show a degree of stiffness, desirable for certain uses. Heating suffices for softening them.

The tensile strength of Murmann metal is stated to be from 35,000 to 50,000 pounds per square inch, consequently considerably greater than that of sheet aluminum, while the tensile strength of wires made of the metal is given as from 42,000 to 52,000 pounds per square inch, which is also greater than that of aluminum. Consequently sheets and wire made from Murmann metal act like those made of brass and will be used where lightness and strength is required, with better fitness for being worked than aluminum. Murmann metal is stated to be extensively used in the automobile industry, for naphtha launches, certain parts of mechanisms, mountings, kitchen utensils, electrical apparatus, bearings for dynamos, blocks for hatters, molds for rubber factories, mountings for photographic lenses, in fact for all cases where lightness combined with strength is needed.

A harder or more brittle metal is used for castings from patterns. These castings can be filed, drilled, cut, planed and very fine screw threads are easily obtained. Castings made in sand molds are claimed to have a tensile strength of 20,000 to 28,000 pounds per square inch and of 28,000 to 35,000 pounds per square inch, the strength of aluminum being a good deal less.

The price of Murmann metal is about one-fourth to one-half higher than that of aluminum, the difference being compensated for by the greater facility of working it and its superior strength. The metal is not altered by atmospheric influences or by its introduction into the wet soil. It can be soldered with any of the alloys used in soldering aluminum, but a special solder has been invented for it by Dr. Murmann. The metal is easily bleached, the cost being practically nothing. There is also a composition made for dying it a deep black, both shining or dull. Special processes enable the metal worker to electroplate this metal with nickel, gold, silver, copper or brass. Samples sent to the office of THE METAL INDUSTRY show it to be a metal of pleasing appearance.

A nickel vanadium alloy made in France has the following composition: Nickel, 65.88%; cobalt, 2.32%; vanadium, 18.80%; silicon, 1.10%; iron, 3.77%; aluminum, 0.15%; manganese, trace, magnesium, 1.81%; phosphorus, 0.01%; copper, 0.05%; arsenic, 0.12%; sulphur, 0.57%; ogygen combined with vanadium, nickel, etc., 3.35%; carbon, 2.07%.

TESTING APPARATUS FOR GAS FITTINGS.

For many years a very primitive method of testing gas and other fittings has been in vogue. The workman was in the habit of putting the fitting to his mouth, and simply sucked at it until he satisfied himself that there was no leak. As white lead is frequently used in the attachment and soldering of brackets, this practice, persisted in for a long period, is simply deadly in its effects. Sometimes it produces poisoned lips; in other cases the particles of lead are drawn into the system. One workman, recently taken to the hospital in a bad way, was treated with a stomach-pump, which extracted particles of white lead and brass dust in considerable quantities. To put an end to this dirty and antiquated system, Mr. Lynes, of Birmingham, England, has devised the leak testing apparatus shown in adjoining figure. The fitting is

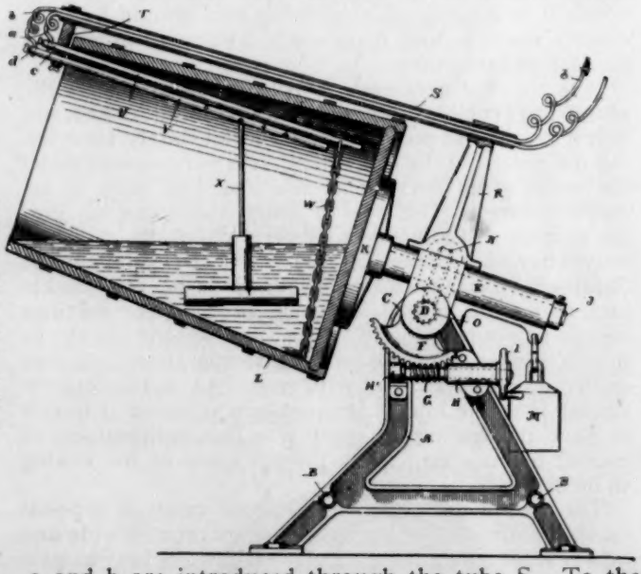
placed on the disc A, against which it is held by the pressure of the hand. Then the operator pressing his foot upon the pump B drives a current of air along the tube into the fitting. The indicator shows the force exerted, and if after the pressure is removed the pointer continues to move, this is taken as evidence of a leak. The fitting still attached to the rubber disc is then plunged into water and the escaping air develops a bubble at the point of the leak. It seems likely that this scientific method will eventually entirely supersede the primitive system described above.

WELDING ANTIMONY ALLOYS.

Considerable difficulty has heretofore been experienced in uniting the alloys forming the junction of a thermoelectric couple. When a soft solder is used, its melting temperature is obviously too low to attain a great efficiency of the thermoelectric battery, while a hard solder cannot be used because its temperature is above the melting point of the antimony or the alloys of that metal, which usually constitute one component of the thermoelectric couple. The two components can furthermore not be united by compression on account of the brittleness of the antimony. A new method has recently been invented in Germany, of uniting the two elements of a thermoelectric couple, consisting of antimony or an antimony alloy as one component and constantan as the second component. Constantan is an alloy of 50 per cent copper and 50 per cent nickel, or 58 per cent copper, 41 per cent nickel and 1 per cent. manganese. The inventor, A. Heil, of Frankfort-on-the-Main, describes the method in U. S. patent 781,338, Jan. 31, 1905. He brings the whole or the end of the constantan component up to about the melting point of the antimony or antimony alloy and then rubs a piece of antimony or antimony alloy strongly, uniformly and completely on the end or contact face of the constantan, until a uniform and adhering lining is formed on the latter, which need not be very thick, but should completely cover the constantan surface, without leaving any defective spot. Then the constantan thus lined is again brought up to the same heat as before and is pressed against the antimony or antimony alloy, forming the second component of the thermocouple. The liquid layer of antimony or antimony alloy on the constantan will then easily unite with the antimony component, and any film or layer of oxide that may have formed on the surface of the antimony will be removed by squeezing or pushing out. The material of the antimony component thus forms itself the solder for uniting the two alloys.

PLATING SMALL OBJECTS.

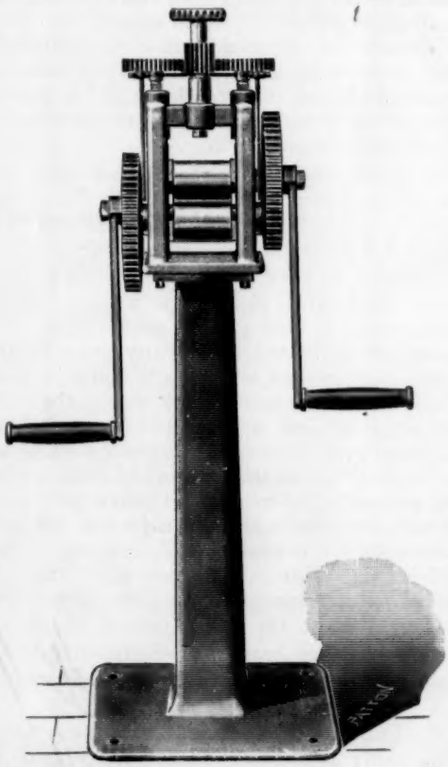
A new tank for the purpose of plating small objects has recently been patented by J. G. Brothwell and G. P. Penley, Torrington, Conn., by U. S. patent 781,327, Jan. 31, 1905. As shown in cross-section in Fig. 1, it consists of a tank L, which is mounted upon a substructure A in such a maner that it can be easily tilted to any desired degree. A counterweight M, insures an easy adjustment of the bracket E, which supports the spindle J on which the tank rests. The electrode wires



a and b are introduced through the tube S. To the negative conducting rod U there is attached a flexible conductor in the form of a metallic chain W, which drags through the solution in contact with the articles submerged in the latter and insures an even and uniform contact. An anode of any suitable shape is suspended from the anode rod. The construction is so arranged that by means of a driving pulley not visible in the figure the tank may be rotated while adjusted at any desired angle. The solution as well as the articles contained in the tank may be quickly dumped out for the purpose of renewal. The materials are caught on a sieve held beneath the mouth of the tank, under which a tight vessel is placed for receiving the plating solution. The articles are stated to be more or less exposed during the plating operation, which fact permits to inspect them while the plating is going on.

HAND ROLLING MILLS.

The METAL INDUSTRY receives from time to time inquiries for small hand rolling mills which are suitable for rolling the soft and white metals. The accompanying cut shows a standard mill manufactured by W. W. Oliver Manufacturing Company, of Buffalo, N. Y. The company have made mills for many years for silversmiths and jewelers. The mills herewith



shown have all the latest improvements, including a lifting device which dispenses with all inner boxes and springs, which is said to be an advantage in exchanging the rolls. The gears are machine cut from solid stock and have a ratio of 4 to 1. Further particulars about these mills and other machinery suitable for silversmiths and manufacturing jewelers may be obtained from the company.

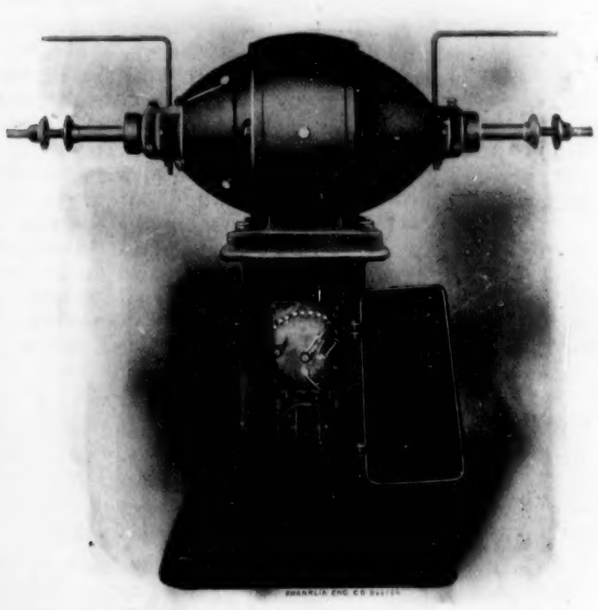
PHOSPHOR TIN.

The properties of phosphor-tin and the advantages of using it in the brass foundry are becoming generally known. Phosphor-tin in very small quantities will clean metals and make them more fluid and dense. It will prevent drossing. In using phosphor-tin in brass foundry mixtures a superior casting will result, as it has a tendency to make a sounder casting of greater tensile strength. The phosphor-tin is added and thoroughly stirred in after the crucible has been taken out of the fire. By using phosphor-tin instead of stick phosphorus the danger of fire and explosion is avoided. In tinning iron and steel 10 per cent. of pure phosphor-tin combined with ordinary tin will make the mixture more lustrous and adhere more firmly to the surface of the iron.

The sales of Banca tin during 1904 amounted to 11,535 tons, as compared with 15,297 tons in 1903 and 15,203 tons in 1902. Billiton furnished 3,126 tons in 1904, 3,600 in 1903, and 3,840 in 1902.

A NEW DIRECT MOTOR DRIVEN POLISHER.

The accompanying illustration shows one of the latest motor driven polishing machines on the market, which should find favor with silversmiths, brass manufacturers and workers in metal in general. The column is heavy and has a large base, and the head is secured to it by a cast steel field ring, thus making a very rigid construction. The spindle is of steel, and collars are provided to prevent dust from entering the bearings, which are large, self-aligning and self-oiling. The case which fully encloses the motor has been provided with a large air space to prevent heating. At the same time, it has been designed to give as much



room as possible around the wheel, so that large pieces of work can be conveniently handled, and adjustable supports for guards are also provided. Doors are placed in the motor case and ready access to the brushes is obtained. The armature and commutator are on a quill entirely independent of the shaft, which arrangement readily allows the substitution of a new shaft. The bronze rheostat and starting switch, the latter being operated by a handle outside at the left, are in the column. The smaller sizes can be used as grinders when fitted with rests, as the motors can be wound for any speed. The machine is made by the Diamond Machine Company, Providence, R. I.

Frederick L. Titsworth, treasurer of the Chicago Brass Company, died at his home in Kenosha, Wis., on Jan. 24th. Mr. Titsworth was 41 years old and had been connected with the Chicago Brass Company for the last twenty years. He was also secretary of the Benedict & Blumham Brass and Copper Company, of Chicago, Ill.

F. G. Richardson died at his home in Queens, Long Island, on January 18th, in his 85th year. Mr. Richardson had been a manufacturer of brass wire since 1844, and as early as 1846 he was awarded a silver medal for the finest and widest brass wire cloth ever made in the United States. His business at 403 Hewes street, Brooklyn, N. Y., is continued by his sons.

CORRESPONDENCE DEPARTMENT

In this Department we will answer questions relating to the non-ferrous metals and alloys. Address THE METAL INDUSTRY, 61 Beekman St., New York

Q.—A correspondent asks for Roman and rose gold solutions.

A.—A Roman solution may be made by dissolving gold in aqua regia, evaporating the solution carefully to dryness and then dissolving the gold chloride thus obtained in distilled water and filtering to get rid of the small amount of metallic impurities usually present in the gold, which impurities have a tendency to influence deleteriously the shade of the deposit obtained. A sufficient amount of distilled water being then added, chemically pure potassium cyanide is put into the solution until the latter becomes clear. A good deal of experience is required with the Roman, as with all gold plating, to get the best results, as a variety of circumstances such as temperature, current density, etc., influence the result. About six dwts. of gold per half gallon of solution are used with satisfactory results, the solution being about 120° F.

A rose gold solution depends upon the addition of copper carbonate to the gold solution. The copper carbonate should be dissolved in potassium cyanide and added to the gold solution until the desired shade of the deposit is obtained, precaution being taken that not too much copper solution is added. The solution is also advantageously used hot.

Q.—A subscriber has trouble with sponginess in the center of brass sticks which he makes and also with pin holes in his castings. He uses a mixture composed of 90 per cent. copper, 5 per cent. tin, 2 per cent. lead and 3 per cent. phosphor-bronze. He uses old scrap and borings of unknown composition to fill up the pot.

A.—The percentage of lead is rather high in the alloy and might with advantage be decreased. It facilitates, of course, the working of the alloy. The trouble may be in the use of the old scrap and borings. No doubt better results would be obtained by the addition of a small amount of phosphor-tin, say one-quarter pound to the 100 pounds of the mixture.

Q.—A plater wants information regarding the electroplating of aluminum.

A.—The plating of aluminum is a very difficult matter, inasmuch as on account of a thin layer of oxide at the surface of the metal the deposits do not adhere well. A good many attempts have been made to overcome this and a number of patents have been taken out, but not much has been accomplished in practice. The usual procedure is to cover the metal with a thin layer of the particular metal that is to be plated on, either by painting a chemical compound containing the metal upon it and firing the aluminum article or by dipping it into hot solutions of salts of the metal to be plated on and thus covering it with a thin film. A bath for copperplating aluminum, which is stated to have been used successfully, is made up of a solution of potassium copper oxalate containing free oxalic acid and some ammonium chloride.

Q.—A subscriber wants to know how to make platinum chloride for oxidizing silver.

A.—The platinum chloride may be purchased as such. If it is desired to make it from the metal, more platinum scrap is dissolved in a mixture of three parts of hydrochloric (muriatic) acid and one part nitric acid. After the metal has al dissolved, the solution is introduced into a porcelain dish and evaporated to dryness, and after all the liquid is driven off, the residue, which consists of platinum chloride, is gently heated in order to drive off all the acid. It is then dissolved in water and alcohol. A solution suitable for oxidizing silver is made up by dissolving one part of platinum chloride in 100 parts of water.

Q.—A subscriber inquires about the necessary amount of aqua regia required to cut down one ounce of gold to make gold chloride. He also wants to know the recipe for a German silver brazing solder and information how to take the fire off sterling silver.

A.—The amount of aqua regia usually taken to dissolve one ounce of fine gold is made up of about four ounces of concentrated chemically pure hydrochloric acid and two ounces chemically pure concentrated nitric acid. This is somewhat above the theoretical amount required and ascertained by chemical calculation, but allows for some excess of acid so as to get a better action. It is immaterial in this case whether there is an excess. Only if too much acid is added it takes longer to evaporate the solution. A good German silver solder contains 45% copper, 45% nickel and 10% of tin. For information concerning the taking the fire off sterling silver see THE METAL INDUSTRY, January, 1905, page 11.

Q.—A subscriber wants a cheap metal for small castings and a recipe for a good mat finish on aluminum.

A.—A cheap metal for small castings may be obtained by using a mixture of 100 parts lead, 58 parts tin, 14 parts antimony, 2 parts copper and ¼ part phosphor-tin. The mat finish for aluminum is obtained by dipping the articles into a strong potash solution, rinsing them in water and dipping them in strong nitric acid, repeating the operation if necessary. It may also be obtained by scratch-brushing or sand-blasting the article.

Q.—A subscriber wants a mixture for Tobin bronze.

A.—Tobin bronze contains about 60 parts of copper and 40 parts of spelter, to every 100 parts of the mixture, there being added ½ pound of tin. If with this amount of tin the alloy is not sufficiently strong, the percentage of that metal may be increased up to 2 per cent. An analysis of the metal showed 60.5% copper, 38.66% zinc, 0.47% tin, 0.28% lead and 0.06% iron, the latter two metals being present as impurities. The average tensile strength on a number of round and hexagonal bars furnished to the Government was about 61,000 pounds per square inch.

Q.—A subscriber wants to know whether the rheostat in plating should be connected to the anode rod and whether in a cyanide solution it will not use more cyanide and less metal and the work will be of as good quality.

A.—It makes no difference where the rheostat in plating is connected into the circuit. The rheostat as its name implies is there for the purpose of introducing resistance into the bath and cutting down the amperage, that is, the quantity of current passing through

the bath. As such it has therefore no influence upon any quality of the work, except to reduce the current to that amount which is requisite in order to produce the best results. It has absolutely no influence upon the chemical reactions in the bath and cannot favor one electrode any more than the other. In fact there is nothing that can do that, as no chemical change occurs at one electrode without a corresponding and equivalent change at the other electrode.

Q.—A plater inquires for the so-called Australian process of directly silverplating iron and steel.

A.—The process is stated to be carried out by first cleaning the iron articles in a dilute solution of hydrochloric acid. They are then introduced into a solution of nitrate of mercury and connected with the zinc pole of a Bunsen element. After the articles have been covered with a layer of mercury, they are washed and introduced into an ordinary silver bath. After the desired deposit of silver has been obtained, the articles are removed and heated to 572 deg. Fahrenheit, so as to vaporize the mercury. Silver deposited in this manner is claimed to adhere more firmly than that obtained by other processes.

Q.—A plating firm wants a solution for the brown finish on gun barrels by the aid of the sponge.

A.—The articles may be cleaned in the usual manner and afterwards with dilute hydrochloric acid. A solution made up of sulphuric acid ½ to one part, sulphate of copper 1 part and water 30 parts is then made up and applied as rapidly as possible to the gun barrels with the aid of a sponge. The barrels are then sponged over with a warm solution of ¼ ounce potassium sulphide in one gallon water, the operation being performed as rapidly as possible. They are then passed through boiling water and dried rapidly. The barrel is used as one electrode.

BOOK REVIEW.

AMERICAN TOOL MAKING AND INTERCHANGEABLE MANUFACTURING. By Joseph V. Woodworth. New York, The Norman W. Henley Publishing Co., 132 Nassau street, publishers. Price, $4.00. 535 pages.

The scope of this book is perhaps better described by its sub-title, which reads: A treatise upon the designing, constructing, use and installation of tools, jigs, fixtures, devices, special appliances, sheet metal working processes, automatic mechanisms, and labor saving contrivances; together with their use in the lathe, milling machine, turret lathe, screw machine, boring mill, power press, drill, sub-press, drop hammer, etc., for the working of metals, the production of interchangeable machine parts and the manufacture of repetition articles of metal. The book contains information upon all these points, written in a clear and practical manner. It is very well illustrated and of pleasing appearance and cannot fail to be of considerable value to any metal worker, who wants to be informed on modern methods. The author evidently has had a great deal of experience in the subject. The book can heartily be recommended not only to the practical metal worker but also to the engineer engaged in constructing appliances for that purpose.

THE METAL INDUSTRY is receiving a number of congratulations on the fine appearance of the February number, subscribers writing that the articles were read with great interest and that the paper abounded with good things for the founder, finisher and plater.

READERS' OPINIONS.

Correspondence is solicited from all of our readers on subjects relating to the founding, finishing, rolling and plating of the non-ferrous metals and alloys. Name and address must be given, though not necessarily for publication. Address THE METAL INDUSTRY, 61 Beekman street, New York.

JAPANESE AND BARBEDIENNE BRONZE AND OLIVE GREEN TONES.

To the Editor of THE METAL INDUSTRY.

Some very beautiful bronze tints of various shades may be produced on copper and brass plated goods, which may prove useful in finishing statuary figures, lamp and other art goods. The following solutions may be used. Solution No. 1 is composed of three ounces of sulphate of copper dissolved in one gallon of nearly boiling water. Solution No. 2 contains one-eighth to one-quarter ounce of sulphide of potash to one gallon of slightly warm water. Copper articles immersed in solution No. 1 immediately assume a dark Japanese bronze tone, which may be relieved on the polishing wheel or with pumice stone. Brass plated goods immersed in this solution without scratch-brushing are covered with a beautiful olive green tone. This may be relieved to show the brass beneath it or the color may be left solid by immersing the articles with the green tone into solution No. 2 for a moment. Barbédienne tones and dark olive green are produced, which when relieved with pumice stone and the rag give beautiful antique brass finishes which are very effective on some classes of goods.

By using a solution composed of one-half ounce commercial acetate of copper and one-half ounce sulphate of copper to one gallon of boiling water and plating the articles in an acid copper bath before immersion, various bronze tones may be produced, which give beautiful effects.

If the articles are then lacquered with a varnish lacquer and greens applied to the backgrounds as mentioned in the article by the author on Verde Antiques in the January, 1905, issue of THE METAL INDUSTRY, Vol. III, page 5, many effective finishes may be produced.

CHARLES H. PROCTOR.

William Braddon, one of the editorial force of *The Metal Worker*, died on February 12th at his home in Queens, Long Island. Mr. Braddon was 50 years of age and had been connected with the David Williams publications since 1892. Besides his connection in trade journalism, Mr. Braddon was interested in church and trade association work. For the past two years he had been instrumental in forming a national organization of sheet metal workers.

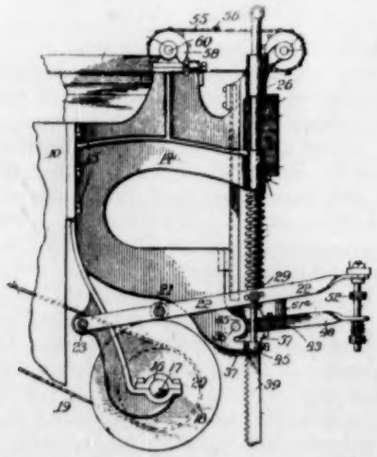
At the last meeting of the American Lighting Fixture Manufacturers at the clubrooms of the Auditorium Hotel in Chicago, on January 24, the following officers were elected: President, W. S. Edwards, Chicago, Ill.; vice-president, W. C. Hine, Cleveland, O.; directors—R. Williamson, Chicago, Ill.; Arthur Polacheck, Milwaukee, Wis.; F. S. Beardslee, Chicago; C. C. Corwin, Toledo, O.; H. G. Willard, Chicago; commissioner, William M. Webster, Chicago.

Mr. Fritz Bornholz, formerly proprietor of the metal-firm of Bornholz & Co., has returned to New York after a two-year's sojourn in California and is again in the harness. Mr Bornholz is an expert in metals and smelting and THE METAL INDUSTRY wishes him success.

PATENTS

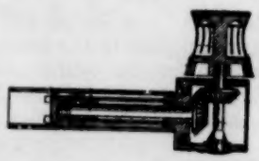
A full copy of any Patent mentioned will be furnished for Ten Cents. Address THE METAL INDUSTRY, 61 Beekman Street, New York

779,555. Jan. 10, 1905. BLANK-FEEDING APPARATUS. Charles B. McDonald and Charles D. McDonald, Chicago, Ill.—The independent, attachable blank-feeding apparatus consists of the combination with mechanism for keeping the pile of blanks at a certain level, of an endless carrier located above the pile and al-



ways moving in one direction. Projections are arranged on the carrier at intervals, and means for lifting the blanks one at a time from the pile and bringing them in the plane of the projections, these means being adapted to hold the lifted blank up until it has been positively engaged by the projections.

779,630. Jan. 10, 1905. SANDING OR POLISHING MACHINE. Frank Urban, Belvidere, N. J.—The sanding or polishing tool comprises a vertically-revolving holder, a spring-jacket surrounding the holder, the lower end of the jacket being slit vertically so as to form spring-fingers, the abrading material adapted to pass underneath the holder and be clamped between the periphery of



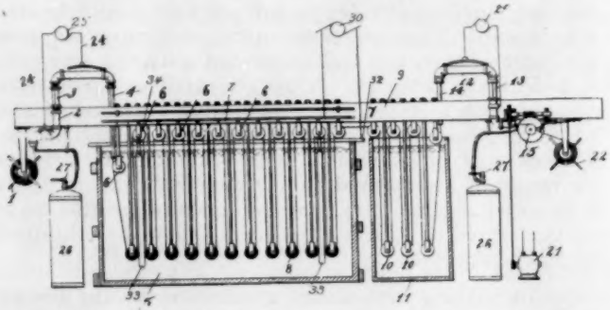
the same and the spring-fingers, means for securing the abrading material to the holder consisting of a cylindrical case open at its upper end in which the spring-jacket is adapted to fit and rest upon the upper edge, the abrading material adapted to be placed over the upper edge of the spring-jacket and the holder forced downward therethrough.

779,523. Jan. 10, 1905. BURNER FOR SOLDERING-FURNACES. Edward T. Burgess, Columbus, Ohio. The burner comprises an integral upwardly-projecting burner-head, and transverse partitions dividing the burner-head into a plurality of combustion-chambers, the burner-head being provided with radiating-openings extending from the combustion-chambers, in combination with a hollow body portion in communication with all the chambers.

779,321 Jan. 3, 1905. METAL-POLISHING MACHINE. Henry Schuessler, Peru, Ill.—The polishing and finishing machine consists of the combination of a bed-frame, means for raising and lowering this frame, a work-table longitudinally movable on the bed-frame, a polishing or finishing roll above the plane of the work-table, a roll-carrying frame having journal-boxes for the polishing-roll, and means for axially moving the roll-carrying frame and the polishing-roll.

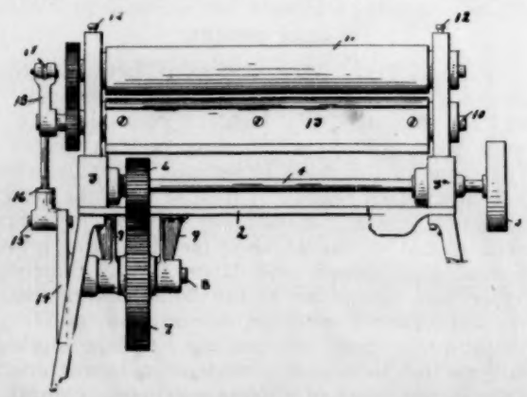
779,192. Jan. 3, 1905. MACHINE FOR CASTING METAL. Carlos Vellino, Barcelona, Spain.—The machine shows a combination, with a mold having a molten-metal inlet and an air-outlet, of parallel cooling-boxes arranged at either side of the inlet and the outlet.

781,867. February 7, 1905. APPARATUS FOR NICKEL PLATING. J. W. Ailsworth, East Orange, N. J.—The apparatus as adapted to the nickel plating of thin steel strips is shown in the figure in cross-section. It is intended not only for nickelplating but also for subjecting the plated strips to a high heat, which causes the actual welding of the nickel plating to the steel surface. The strip passes from a reel 1 through a metal tube 2 provided with a glass section 3 for insulating purposes. In this tube it is heated by electricity in the presence of hydrogen gas supplied by tank



26, in order to clean it preparatory to plating. It then enters the plating bath, where it travels over a series of pulleys and receives a nickel deposit. It then goes into the washing tank 11 and from there passes into the welding chamber 12, where it is brought to a welding heat by electricity furnished from dynamo 25. The welding also takes place in an atmosphere of hydrogen, which is supplied from tank 26. The wire then passes over a feed wheel 15 and then on the reel 22.

782,361. February 14, 1905. BENDING MACHINE. A. G. Scherer, Chicago.—The bending machine is provided with a pair of rollers, one of which has a portion of its surface flattened. By a suitable mechanism, screwed to this flattened part, provision is made so that a strip or edge of the sheet of metal to be bent can be readily



inserted, so that when the lower roller is given a partial rotation, the edge of the metal is bent and compressed. The rolls are then moved in the opposite direction so that the crimped or bent edge of the metal can be readily removed.

781,300. January 31, 1905. MANUFACTURING OF METALLIC ALLOYS. T. Prescott, Huddersfield, England.—The inventor employs the following ingredients for the manufacture of his alloy: Zinc, aluminum, iron and silicon. The ingredients are preferably employed in the following proportion: zinc, 53.50 to 74.75 parts; aluminum, 25 to 43.50 parts; iron, 0.25 to 2 parts and silicon, 0.25 to 1 part. The silicon is stated to be furnished from a powder made up of the following: potassium silico fluoride, 23.25 parts; calcium chloride, 25.82 parts; powdered glass, 31.20 parts; carbonate of soda, 3.72 parts; carbonate of lime, 3.10 parts, and common salt, 12.92 parts. In making the alloy the iron is first melted and the aluminum is then added and when this is thoroughly melted the zinc is added and then the powder is spread over the surface of the molten metal.

TRADE NEWS

Trade News of Interest Desired from All of our Readers. Address THE METAL INDUSTRY, 61 Beekman St., New York.

Drosses, skimmings, residues, ashes and machinery of all metals are bought and sold by Walsh's Son & Co., Newark, N. J.

The Walton Novelty Works, of Walton, N. Y., was completely destroyed by fire the morning of February 13. The company manufactured wood and metal specialties.

The Kettler Brass Manufacturing Company, of Dallas, Tex., have made all arrangements to move their plant to Houston, and expect to be located there about the middle of March.

The Monarch Metal Company, of Chicago, Ill., with a capital of $2,500 have been incorporated to manufacture babbitt metals. H. L. Lemon, F. W. Winkler and A. H. Lemon are the incorporators.

The Prentiss Tool and Supply Company, of New York city, have been appointed selling agents for the line of shapers and gear-cutting machines produced by Gould & Eberhardt, Newark, N. J.

Benjamin Downs has bought an interest in and taken charge of the Brass Foundry of Harry A. Spears, 130 Oliver street, Boston, Mass. Mr. Downs has had many years' experience as foreman.

The Midland Brass Works, of Fort Worth, Tex., are sending out leaflets showing specialties which they can furnish, which include plumbers' brass goods, stop and waste cocks, pump cylinders, etc.

Sheet steel spout foundry bellows and "Esso" gluetrin core binder and steel barrows are some of the supplies announced in the circular matter issued by the S. Obermayer Company, of Cincinnati, O.

The Monarch Engineering and Manufacturing Company, of Baltimore, Md., report that their Steele-Harvey Crucible Melting Furnace is specially adapted for melting yellow brass, borings and turnings.

H. M. Spencer & Co., of Holyoke, Mass., have bought the Foudrinier wire looms of the Wright Wire Company, which will give Spencer & Co. increased facilities for manufacturing wire cloth and dandies.

Putnam & Hall, of Rome, N. Y.; the Louisville Advertising Company, Louisville, Ky.; and J. H. Matthews Company, of Pittsburg, Pa., have organized a company with $100,000 capital stock to manufacture metal signs.

A case involving $5,000 between the Pittsfield Brass Company, of Pittsfield, Mass., and A. L. D. Buxton, of Worcester, Mass., which has been in the courts for the past six years, is to be argued before the Master on March 3.

The Genesee Metal Works, of Rochester, N. Y., report that their business on ingot brass has increased to such an extent that they have exceeded their capacity and are compelled to work day and night to fill their orders.

The directors of the Rome Metal Company, Rome, N. Y., have elected the following officers for the ensuing year: President, W. R. Huntington; vice-president, Dr. W. J. P. Kingsley; secretary and treasurer, Jonathan S. Hasel:on.

William Yates Lloyd, of Chicago, Ill., and his son from Freeport, Ill., have established a brass foundry at Rock Falls, Ill. The new foundry expects to get considerable of the brass work required by the industries of Freeport.

On February 1 the McKenna Brothers Brass Company, of Pittsburg, Pa., opened an office and salesroom at 714 Broadway, New York. The company manufacture all sorts of brass goods and are agents for several special grades of tool steel.

The Gobeille Pattern Company, of Cleveland, O., are issuing a blotter on which they announce that in ninety days they have received orders for patterns from a single foundry to the amount of $7,279. The blotter also contains the cut of a wise owl.

The M. S. Benedict Manufacturing Company have closed their Ottawa (Ill.) plant and will now manufacture all of their goods at their works at East Syracuse, N. Y., where they have an extensive factory and have just put up an additional building.

In filing their annual report with the Town Clerk, the Coe Brass Manufacturing Company, of Torrington, Conn., named the following officers: President, Charles F. Brooker; treasurer, Edward T. Coe; secretary, James A. Doughty; assistant secretary, Elisha J. Steele.

R. A. Moore & Son, buckle manufacturers, of New Britain, Conn., have sold out their machinery and business to several of the leading buckle manufacturers of Connecticut. The Traut & Hine Manufacturing Company, of New Britain, negotiated the purchase.

Richards & Co., metal dealers, of Boston, Mass., are now completely established in their new building, which extends from 200-206 Causeway street to 117-125 Beverly street. They report a brisk business for this time of the year. They sell the "Malta" brand of phosphor tin.

The Niagara Falls Machine and Foundry Company, Limited, of Niagara Falls, Can., secured the contract this year for the supply of iron and brass castings for the Welland Canal. The brass work consists of bushings, nuts and special valves for the repair and construction of lock gates.

On another page will be found an advertisement of an aluminum plant which is for sale. Any readers of THE METAL INDUSTRY desiring to enter the aluminum business have the opportunity of purchasing a well-equipped plant suitable for the manufacture of aluminum novelties, tableware particularly.

The Morse Twist Drill and Machine Company, of New Bedford, Mass., have purchased recently three lots of land with the buildings thereon extending from Fifth to Sixth streets, between Wing and Bedford streets. It is not the present intention of the company to use these lots for building purposes.

A window display of the brass goods made by the Barlow Manufacturing Company, of Holyoke, Mass., has attracted a good deal of attention in that city. The company manufacture brass goods for advertising purposes and are ready at any time to figure on cast, turned, spun or other brass work.

At the annual meeting of the Elm City Brass and Rivet Company, Plainville, Conn., the following officers were elected: President, T. W. Corbett; secretary, John B. Minor; treasurer and manager, A. H. Condell. The company are manufacturers of brass fireplace fixtures and ornamental metal work.

At the annual meeting of the Haydenville Company, of Haydenville, Mass., which was held at their Jersey City (N. J.) office, the regular annual dividend of 5 per cent. was declared and the following officers were elected: C. J. Hills, president; C. K. Sanborn, vice-president; A. S. Hills, treasurer and secretary.

The Harris-Kilpatrick Brass Company have been incorporated at Elizabeth, N. J., to carry on a brass foundry and deal in bronze, brass, copper, aluminum and other castings. The capital stock is $25,000 and the incorporators are Uriah L. Harris, William Kilpatrick, Henry G. Anderson and William D. DeLamater.

The Ferracute Machine Company, of Bridgeton, N. J., have moved all of their machinery from their temporary quarters into their new buildings and have also installed a considerable amount of new machinery. They announce that they are now in a better position than ever to furnish presses, dies and sheet metal tools.

The Columbus Brass Company, of Columbus, O., have increased their capital stock from $75,000 to $200,000 and will move from their present quarters on North Sixth street to 212 North Fourth street, where they will have larger quarters for their jobbing business and more extensive stock room. C. H. Lindenburg is the president of the company.

Several companies have written THE METAL INDUSTRY that they are equipped for and have made aluminum bobbins both in sheet and in cast form. The companies having a plant suitable for making them are: The New Jersey Aluminum Company, of Newark, N. J.; the Metal Manufacturing Company, of New Haven, Conn.; and the Joseph C. Pickup Brass Company, of Providence, R. I.

The Nassau Smelting and Refining Works, which has a very large smelting plant in West Twenty-ninth street and Eleventh avenue, New York, are producing on a large commercial scale phosphor-tin, which they claim is the only pure phosphor-tin with a maximum percentage of phosphorus and which is so perfectly alloyed that none of the phosphorus will be lost in remelting.

At a special meeting of the Bristol Brass Company, Bristol, Conn., held February 3, Charles T. Treadway was chosen as a director to occupy the vacancy caused by the death of his father, Charles S. Treadway. The following officers were elected: President, Pierce N. Welch; vice-president and treasurer, J. R. Holley; secretary and assistant treasurer, Samuel B. Harper. Mr. Holley was also appointed general manager.

George H. Chandler & Co. have established new quarters at Green and Columbia streets, Newark, N. J., and are ready to make molds for castings, white metal, britannia, spelter, figures, lamps, statuary, clocks, toys and advertising novelties of every description. They also cut dies for jewelers, silversmiths and button manufacturers and do modeling. Mr. Chandler has made the art of mold-making a special study for years.

At the annual meeting of the Lee Injector Company, of Port Huron, Mich., the name was changed to the Lee Manufacturing Company, and the following officers were elected: President and general manager, W. O. Lee; vice-president, George F. Conner; secretary, E. L. Moak; treasurer, W. L. Jenks; mechanical superintendent, W. H. Noble. The company manufacture a very complete line of steam brass goods and pneumatic tools.

A very elaborate catalogue on Architectural Sheet Metal Work and Statuary is issued by the W. H. Mullins Company, Salem, O. The catalogue contains halftone prints of a great variety of statues which have been erected all over the country and which are stamped from sheet bronze, copper, and zinc. The business has been carried on for many years by Mr. W. H. Mullins and has recently been incorporated, Mr. Mullins giving an interest in the business to the heads of his departments and a number of the employees.

The Metal Manufacturers' Supply Company, which have been incorporated recently with a capital of $10,000, have leased the entire building at 626 Cherry street, Philadelphia, Pa., and are carrying a large stock of supplies for grinders, polishers and electroplaters. The company also manufacture a line of brushes including hand and circular wheels in tampico, bristle, brass and steel wire. The officers of the company are: Thomas S. Riebel, president; Thomas J. Ryan, secretary and treasurer; Raymond J. Fries, vice-president and general manager.

The R. J. Schwab & Sons Company, furnace men of Milwaukee, Wis., have completed arrangements with the O. O. Storle Valve Company, of Tacoma, Wash., to take a large interest in the Tacoma Company and manufacture their valves. The Storle valve differs from the ordinary form of valve by having a plunger which works up and down in the globe completely surrounded by steam or water having pressure on all sides. The Schwab Company will make iron body valves with brass or bronze fittings and may manufacture complete brass valves in the smaller sizes.

The Syracuse Smelting Works, with factories at Seattle, Wash., and Montreal, Can., have been appointed sole agents for the United States of the Montreal Copper Company whose office is at 31 Peck Slip, New York. The Syracuse Company state that considerable of the company's copper is being exported to Europe and an analysis shows it to be 99.60 per cent. pure. The Syracuse Company also say that they were one of the first concerns in America to produce phosphor-tin and that they can put in the tin all the phosphorus that it will hold. They issue a pamphlet giving the directions for the introduction of their phosphor-tin.

NEW ROCKWELL CATALOGUE.

The Rockwell Engineering Company, 26 Cortlandt street, New York city, have just issued an elaborate catalogue in which the Rockwell Furnace is shown in all positions and a complete description is given of the construction and operation of the furnace. There are a number of valuable tables giving the records of a month's run of the furnace in several foundries and complete particulars of the sizes of the furnaces, the various parts composing it and other information of interest to metal melters. On the last page is a cut and description of the Rockwell Ladle Heater, which, it is said, will heat a ladle hot enough to melt brass in a ten-minute run. The same fuel and air pipes which serve the double chamber Rockwell furnace will serve the ladle heater.

THE TAYLOR CLAMP.

The Hudson Rolling Mill Company, of Bloomfield, N. J., have become interested and are manufacturing what is known as the Taylor Quick Adjusting Self-Locking Screw Clamps. The business is being carried on under the title of The James L. Taylor Manufacturing Company, and at present it will occupy a part of the plant of the Hudson Company's rolling mill. William S. Benson is president of the Hudson Rolling Mill Company and is also secretary and treasurer of the Taylor Company. The clamps are made in a variety of sizes up to 12 feet in length. The company also make a light clamp, used for fastening molds together, which is said to be a great saving over the common method of clamp and wedge, as the Taylor Clamp is adjustable to any size opening in a few seconds of time. A number of orders have been received from the Government Navy Yards.

WANT ADVERTISEMENTS

POSITION WANTED by experienced chemist in brass and bronze, white and bearing metals, alloys, assay of tin, lead and zinc drosses and all that class of non-ferrous material. Address, Chemist, 3811 Pier Street, Pittsburgh, Pa.

WANTED—Alloys that will withstand the action of sulphuric acid of 55° Be. and 8° to 30° Be. at 70° F. Peter T. Austen, 89 Pine Street, New York.

A PLATER with a shop which has been established six years in a good western city would like to associate himself with a good reliable experienced gold and silver plater and burnisher. $2,000 required. Your experience is more essential than money. Address PLATER, THE METAL INDUSTRY.

A PRACTICAL BRASS MOULDER, having from twelve to fifteen hundred dollars can purchase one of the best jobbing brass foundries in one of the leading cities of Ohio. Business established several years. Splendid contracts paying good prices. Reason for selling, owners have other interest that demands their attention. Address B. B. F., care METAL INDUSTRY.

Metal Prices, March 1, 1905

METALS

	Price per lb
TIN—Duty Free.	
Straits of Malacca	28.50
COPPER, PIG, BAR AND INGOT AND OLD COPPER—Duty Free. Manufactured 2½c. per lb.	
Lake	15.37½
Electrolytic	15.25
Casting	15.00
SPELTER—Duty 1½c. per lb.	
Western	6.20
LEAD—Duty Pigs, Bars and Old 2⅛c. per lb.; pipe and sheets 2½c. per lb.	
Pig Lead	4.50
ALUMINUM—Duty Crude, 8c. per lb. Plates, sheets, bars and rods 13c. per lb.	
Small lots	37.00
100 lb. lots	35.00
1,000 lb. lots	34.00
Ton lots	33.00
ANTIMONY—Duty ¾c. per lb.	
Cooksons	8.12½
Hallets	8.87½
Other	7.62½
NICKEL—Duty 6c. per lb.	
Large lots	45 to 50
Small lots	50 to 75
BISMUTH—Duty Free	$1.50 to $2.00
PHOSPHORUS—Duty 18c. per lb.	
Large lots	45
Small lots	65 to 75
	Price per oz.
SILVER—Duty Free—Commercial Bars	$0.60
PLATINUM—Duty Free	19.00
GOLD—Duty Free	20.00
QUICKSILVER—Duty 7c. per lb. Price per Flask.	42.00

Zinc—Duty, Sheet, 2c. per lb. 600-lb. casks, 8.00 per lb., open, 8.50 per lb.

Tobin Bronze—Rods, Unfinished, 19c.

Tobin Bronze—Rods, Finished, 20c.

PRICE FOR ALUMINUM BRONZE INGOTS.

	Per pound.
2½ per cent	19c.
5 per cent	19½c.
7½ per cent	20½c.
10 per cent	21½c.

Manganese Bronze, Ingots	16 to 17c.
Phosphor Bronze, Ingots	16 to 20c.
Silicon-Copper, Ingots	32 to 36c.

OLD METALS

Heavy Cut Copper	13.25c.	14.50c.
Copper Wire	13.00c.	14.25c.
Light Copper	11.75c.	13.00c.
Heavy Mach. Comp.	11.25c.	12.50c.
Heavy Brass	8.50c.	9.50c.
Light Brass	7.00c.	8.00c.
No. 1 Yellow Brass Turnings	7.75c.	8.75c.
No. 1 Comp. Turnings	10.00c.	11.00c.
Heavy Lead	4.00c.	4.35c.
Zinc Scrap	4.40c.	4.75c.
Scrap Aluminum, sheet, pure	22.00c.	25.00c.
Scrap Aluminum, cast, alloyed	12.00c.	18.00c.
Old Nickel	15.00c.	25.00c.
No. 1 Pewter	20.00c.	21.00c.

PRICES OF SHEET COPPER

SIZES OF SHEETS.		96oz. & over 75 lb. sheet 30x60 and heavier	64oz. to 96oz. 50 to 75 lb. sheet 30x60	32oz. to 64oz. 25 to 50 lb. sheet 30x60	24oz. to 32oz. 18¾ to 25 lb. sheet 30x60	16oz. to 24oz. 12½ to 18¾ lb. sheet 30x60	14oz. and 15oz. 11 to 12½ lb sheet 30x60
		CENTS PER POUND.					
Not wider than 30 ins.	Not longer than 72 ins.	19	19	19	19	19	20
	Longer than 72 ins. Not longer than 96 ins.	19	19	19	19	19	20
	Longer than 96 ins.	19	19	19	19	19	21
Wider than 30 ins. but not wider than 36 ins.	Not longer than 72 ins.	19	19	19	19	19	21
	Longer than 72 ins. Not longer than 96 ins.	19	19	19	19	19	21
	Longer than 96 ins. Not longer than 120 ins.	19	19	19	19	20	22
	Longer than 120 ins	19	19	19	20	21	
Wider than 36 ins. but not wider than 48 ins.	Not longer than 72 ins.	19	19	19	20	21	23
	Longer than 72 ins. Not longer than 96 ins.	19	19	19	20	22	24
	Longer than 96 ins. Not longer than 120 ins.	19	19	19	21	23	27
	Longer than 120 ins.	19	19	20	22	25	
Wider than 48 ins. but not wider than 60 ins.	Not longer than 72 ins.	19	19	19	20	22	25
	Longer than 72 ins. Not longer than 96 ins.	19	19	19	21	23	28
	Longer than 96 ins. Not longer than 120 ins.	19	19	20	22	25	
	Longer than 120 ins	20	20	21	23	27	
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 ins.	19	19	20	22	27	
	Longer than 96 ins. Not longer than 120 ins.	19	19	21	24	29	
	Longer than 120 ins.	20	20	22	27		
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 ins.	20	20	22	25		
	Longer than 96 ins. Not longer than 120 ins.	21	21	23	26		
	Longer than 120 ins.	22	22	24	28		
Wider than 108 ins.	Not longer than 132 ins.	23	23	25			
	Longer than 132 ins.	24	24	27			

Rolled Round Copper, ⅜ inch diameter or over, 19 cents per pound. (Cold Drawn, Square and Special Shapes, extra.)

Circles, Segments and Pattern Sheets three (3) cents per pound advance over prices of Sheet Copper required to cut them from.

All Cold or Hard Rolled Copper, 14 ounces per square foot and heavier, one (1) cent per pound over the foregoing prices.

All Cold or Hard Rolled Copper, lighter than 14 ounces per square foot, two (2) cents per pound over the foregoing prices.

Cold Rolled and Annealed Copper, Sheets and Circles, wider than 17 inches, take the same price as Cold or Hard Rolled Copper of corresponding dimensions and thickness.

All Polished Copper, 20 inches wide and under, one (1) cent per pound advance over the price for Cold Rolled Copper.

All Polished Copper, over 20 inches wide, two (2) cents per pound advance over the price for Cold Rolled Copper.

Planished Copper, one (1) cent per pound more than Polished Copper.

Cold Rolled Copper prepared suitable for polishing, same prices and extras as Polished Copper.

Tinning Sheets, on one side, 2½c. per square foot.

For tinning both sides, double the above price.

For tinning the edge of sheets, one or both sides, price shall be the same as for tinning all of one side of the specified sheet.

Metal Prices, March 1, 1905

Net Cash Prices.

COPPER BOTTOMS, PITS AND FLATS.

14 oz. to square foot, and heavier, per lb..... 23c.
Lighter than 10 oz..... 29c.
10 oz. and up to 12 oz..... 26c.
12 oz. and up to 14 oz. to square foot, per lb..... 24c.
Circles less than 8 in. diam., 2c. per lb. additional.
Circles over 13 in. diam. are not classed as Copper Bottoms.
Polished Copper Bottoms and Flats, 1c. per lb. extra.

PRICE LIST FOR ROLL AND SHEET BRASS

Prices are for 100 lbs. or more of sheet metal in one order.
Brown & Sharpe's Gauge the Standard.

Common High Brass	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
Wider than and including	2 12	12 14	14 16	16 18	18 20	20 22	22 24	24 26	26 28	28 30
To No. 20 inclusive..	.22	.23	.25	.27	.29	.31	.33	.36	.39	.42
Nos. 21, 22, 23 and 24	.22	.24	.26	.28	.30	.32	.34	.37	.40	.43
Nos. 25 and 26.....	.23	.24½	.27	.29	.31	.33	.35	.38	.41	.44
Nos. 27 and 28.....	.23	.25	.28	.30	.32	.34	.36	.39	.42	.45

Add ½ cent per lb. additional for each number thinner than Nos. 28 to 38, inclusive.

Add 7 cents per lb. for sheets cut to particular lengths, not sawed, of proportionate width.

Add for polishing on one side, 40 cents per square foot; on both sides, double this price.

Brazing, Spinning and Spring Brass, 1 cent more than Common High Brass.

Extra Quality Brazing, Spinning and Spring Brass, 2 cents more than Common High Brass.

Low Brass, 4 cents per lb. more than Common High Brass.

Gilding, Rich Gold Medal and Bronze, 7 cents per lb. more than Common High Brass.

Discount from List, 30 per cent.

PRICE LIST FOR BRASS AND COPPER WIRE

BROWN & SHARPE'S GAUGE THE STANDARD.	Com. High Brass	Low Brass	Gilding Bronze and Copper
All Nos. to No. 10, Inc	$0.23	$0.27	$0.28
Above No. 10 to No. 16	.23½	.27½	.28½
Nos. 17 and 18	.24	.28	.32
" 19 and 20	.25	.29	.33
No. 21	.26	.30	.34
" 22	.27	.31	.35
" 23	.28	.32	.36
" 24	.30	.34	.38

Discount, Brass Wire, 30 per cent.; Copper Wire, 30 per cent.

PRICES FOR SEAMLESS BRASS TUBING.

From 1¼ in. to 3½ in. O. D. Nos. 4 to 13 Stubs Gauge, 20c. per lb.
Seamless Copper Tubing, 23c. per lb.
For other sizes see Manufacturers' List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron Pipe size	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Price per lb	28	27	22	21	20	20	20	20	20	20	20	21	22	24	26	27

BRAZED BRASS TUBING

Brown & Sharpe's Gauge the Standard.

								Per lb
Plain Round Tube,	⅛	in.	up	to	2	in.,	to No. 19,	inc.	$0 35
" " "	⅛	"	"		⅛	"	" 19,	"	36
" " "	⅛	"	"		⅛	"	" 19,	"	38
" " "	⅛	"	"		⅛	"	" 19,	"	41
" " "	⅛	"	"		⅛	"	" 19,	"	48
" " "	⅛	"	"		⅛	"	" 19,	"	55
" " "	⅛	"	"		¼	"	" 19,	"	1 06
" " "	⅛	"	"		⅛	"	" 19,	"	1 50
Smaller than ¼ inch									Special
2 inch to 3 inch, to No. 19, inclusive									38
3 inch									40
Over 3 inch to 3½ inch									45
Over 3½ inch									50

Bronze and copper advance 3 cents. Discount 35 per cent.

PRICE LIST FOR SHEET ALUMINUM

PLATE AND SHEET PRICE LIST.—B. & S. GAUGE.
Prices are for 50 pounds or more at a time. Less quantities, 5 cents per pound additional. Charges made for boxing.

Wider Than.. And Including..	55 in. 60 in.	50 in. 55 in.	45 in. 50 in.	40 in. 45 in.	36 in. 40 in.	30 in. 36 in.	24 in. 30 in.	20 in. 24 in.	18 in. 20 in.	16 in. 18 in.	14 in. 16 in.	6 in. 14 in.	*3 in. 12 in.	in coils.	Polishing One Side.	Sat. Fin. without Lacquer. One Side.
No. 13 & heavier												Not wider than 6 in.			8	9
" 14															8	9
" 15															8	9
" 16															8	9
" 17															8	9
" 18															8	9
" 19															8	9
" 20															8	9
" 21															8	9
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" 29															8	9
" 30															8	9
" 31															8	9
" 32															8	9
" 33															8	9
" 34															8	9
" 35 & 36															8	9
" 37 & 38															8	9
" 39 & 40															8	9
".008" to .0015"													1 07	1 08	22	23
Less than .0015"													1 08	1 09	23	24
													1 09	1 10	24	25
													1 10	1 11	25	26
													1 11	1 12	26	27
													1 12	1 13	27	28
													1 13	1 14	28	29

A additional charge for slitting coiled sheet in widths less than 3 in. and flat rolled sheets in widths less than 6 in.
All columns except the first are for Flat Rolled Sheets.

Discounts as follows are given for sheet orders over 200 pounds.

200 to 1,000 pounds	10 per cent. off list.				
1,000 to 2,000 "	10 per cent. and	2	"	"	
2,000 to 4,000 "	10 " "	3	"	"	
4,000 pounds and over	10 " "	5	"	"	

Sheets polished or satin-finished on both sides, double the price for one side.

Price Per Foot of Seamless Aluminum Tubing.

(CHARGES MADE FOR BOXING.)

THICKNESS OF WALL IN STUBS' GAUGE.

Outside Diameter in Inches.	No. 12.	No. 14.	No. 16.	No. 18.	No. 20.	No. 22.	No. 24.	Outside Diameter in Inches.
1-4	.....	.....	.....	10	9	8	7	1-4
5-16	.....	.....	.....	11	9	8	7	5-16
3-8	.....	.....	.....	12	9	8	7	3-8
1-2	.....	.....	17	14	11	9	8	1-2
5-8	.....	.....	21	16	13	12	.....	5-8
3-4	.....	.....	25	19	16	14	.....	3-4
7-8	.....	.....	28	22	18	16	.....	7-8
1	.....	.....	30	25	21	19	.....	1 00
1 1-4	.....	.....	36	30	25	.....	.....	1 1 4
1 1-2	.....	52	43	35	28	.....	.....	1 1-2
1 3-4	.....	60	50	41	33	.....	.....	1 3 4
2	84	68	58	47	37	.....	.....	2 00

Discount 20 to 30 per cent.

ALUMINUM

Drawn Rod and Wire Price List.—B. & S. Gauge.

Diameter B.& S.G'ge.	0000 to No.10	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.	No. 20.	No. 21.	No. 22.
Price per lb	$ 38	38½	38½	0 39	39½	0 40	40½	0 41	0 42	0 43	0 44	0 47	0 52

200 lbs. to 30,000 lbs., three cents off list.
30,000 lbs. and over, four cents off list.